



DEPARTMENT OF TRANSPORTATION
HAZARDOUS MATERIALS REGULATIONS BOARD
WASHINGTON, D.C. 20590

[49 CFR Parts 173, 179]

[Docket No. HM-10; Notice No. 68-8]

TRANSPORTATION OF HAZARDOUS
MATERIALS

Tank Car Specifications

The Hazardous Materials Regulations Board is considering amending Parts 173 and 179 of the Hazardous Materials Regulations to authorize the use of additional tank cars and to include tank car specifications for these tank cars. These proposed amendments are almost entirely based on requests for the adoption of additional tank car specifications submitted by the Association of American Railroads (AAR). The tank car proposals submitted by the Committee of the AAR were based largely on experience gained under a number of outstanding special permits.

Interested persons are invited to participate in the making of these proposed rules by submitting written data, views, or arguments as they may desire. Communications should identify the regulatory docket and notice number and be submitted in duplicate to the Secretary, Hazardous Materials Regulations Board, Department of Transportation, 400 Sixth Street SW., Washington, D.C. 20590. Communications received before February 18, 1969, will be considered by the Board before taking final action on the notice. All comments will be available for examination by interested persons at the Office of the Secretary of the Board both before and after the closing date for comments. The proposals contained in this notice may be changed in light of comments received.

These proposals are set forth in the type of detailed specifications that have been used for many years in this field. As has been announced previously (see for example the proposed oil pipeline regulation (33 F.R. 10213 and the notice published in 33 F.R. 11862)), it is the Board's intention in the future to prescribe minimum performance type requirements rather than detailed specification type requirements. However, in view of the substantial amount of time and effort of both the industry and of the Federal Railroad Administration that can be saved through the elimination of many special permits, it is desirable to issue this proposal in the traditional specification form rather than to let the existing situation stand while performance specifications are developed.

The special commodity requirements presently shown in §§ 179.102 and 179.202 relating to pressure tank car tanks and non-pressure tank car tanks, respectively, have for the most part been relocated in appropriate sections of Part 173 applicable to the commodity. This is for consistency of format since the subject material is primarily applicable to shipper requisites rather than to specifications for the construction of tank car

tanks. Those requirements presently in §§ 179.102 and 179.202 pertinent to the construction of the tank have not been altered. This relocation affects §§ 173.24, 173.264, 173.268, and 173.314 in Part 173.

Section 179.2(a)(4) identifies "DOT" and "Department" as the Department of Transportation. Similar editorial adjustments are reflected in §§ 179.3, 179.4, and 179.5. In § 179.6, reference is made to Appendix R of the AAR Specifications for Tank Cars. Section 179.12-2(b) would permit a 20 percent reduction in carbon steel pipe, if welded, and would reflect provisions that have been incorporated in other tank car standards for many years.

Section 179.100, in addition to updating section cross-references and incorporating references to various appendices of the AAR Specifications for Tank Cars, requires, at subsection 4, that the jacket covering insulation be of a thickness not less than eleven gauge. At subsection 6, more stringent requirements are added to assure that tank plates are not reduced during forming below specification requirements. Also the welded joint efficiency factor change to 1.0 recognizes improvements in welding and weld inspection over the years in addition to the fact that all such tank welds are 100 percent radiographed. At subsection 7 the tables are deleted and in place thereof reference is made to Appendix M of the AAR Specifications for Tank Cars which includes all approved materials including specifications on high tensile strength steel, and on cladding. Subsection 14 would define more clearly the limitation on extreme projection of bottom outlets on cars. Paragraph (a)(5) would require a screw plug on closure which has been standard approved practice, but never specified heretofore. Subsection 15(a) is to be consistent with § 179.100-1 which includes valve flow rating pressures for safety-relief valves. Subsection 15(c) would require the safety-relief valve on specification 105A500W tanks to be set for a start-to-discharge pressure of 360 p.s.i. in keeping with current practice.

Section 179.101 provides for the construction of tank cars to new specifications 114A400W, 117A340W, 120A300W, and 112A400F. At the same time, provisions are made for specifying valve flow rating pressure, and for bottom outlets on certain cars.

Section 179.102 has been altered as previously mentioned. In addition, provisions for liquefied carbon dioxide and chlorine tanks to accommodate the use of new steels are made. Provisions for the alternate setting of safety-relief valves on butadiene and vinyl chloride tanks are made. Additionally, provisions have been made for hydrogen sulfide tanks built to specification 105A600W.

Section 179.103 adds special requirements for class 117AW uninsulated tank cars used in the dual service of compressed gases and flammable liquids; and 120AW insulated tank cars used in the

dual service of compressed gases and flammable liquids. Subsection 5 provides specific requirements for approved bottom outlet valves.

Section 179.200, general specifications applicable to nonpressure tank cars, makes substantive changes in subsections 3, 4, 6, 7, 15, 16, 17, 22, and 24. Subsection 4 requires insulation on tanks to be covered with a metal jacket not less than 11 gauge. Subsection 6 is clarified to assure that thickness of tank plate is not reduced during forming below specification requirements. Also the weld joint efficiency factor is to be 1.0 for seamless heads of all tanks. Subsection 7 omits reference to ASTM specifications in preference to adoption of Appendix M of the AAR Specifications for Tank Cars which appendix has been updated in keeping with current industry practices. Subsection 15 has been amended to delete reference to AAR specification M-402, Grade 35018, malleable iron castings. Subsection 16 requires the application of shutoff valves at specific locations on the tank when top loading and discharge devices are installed. Subsection 17 would define more clearly the limitation on extreme projection of bottom outlets on cars with truck centers less than or greater than 60 feet 6 inches. Subsection 22 is addressed to all lined tanks instead of rubber-lined tanks only. Subsection 24 adds paragraph (b) to provide an abbreviated marking for class 111A tank car tanks by omitting the suffix numeral.

Section 179.201-1 provides for the construction of tank cars to new specifications 111A100ALW, 111A60W2, 111A60W5, 117A340W, 120A300W, 111A60W1, 111A60ALW2, 111A100ALW1, 111A100ALW2, and 111A60W7. Subsection 3 makes distinct the requirements applying to rubber-lined tanks and tanks lined with material other than rubber. Subsections 4, 5, and 6 adopt by reference the requirements specified in Appendix M of AAR Specifications for Tank Cars. Subsection 7 requires safety relief devices to comply with § 179.200-18.

Section 179.202 has been altered as previously mentioned. In addition, reference to hydrofluoric acid, and nitric acid has been included.

Sections 179.220 and 179.221 have been added to provide general specifications applicable to class 115AW tank cars consisting of an inner container supported within an outer shell.

In §§ 179.300-6 and 179.300-8 more stringent requirements are added to assure that tank plates are not reduced during forming below specification requirements. In subsection 7 reference to ASTM specifications has been deleted in preference to adopting certain material specifications by reference to Appendix M of the AAR Specifications for Tank Cars. In subsection 17 the tests for frangible discs of safety vents are required to comply with Appendix A of the AAR Specifications for Tank Cars.

In § 179.301, a correction is made to the values prescribed for the safety relief devices applicable to 110A1000W tanks.

The change to § 179.302 rearranges the commodities in alphabetical order and consolidates the family of aluminum alkyls (pyrophoric materials) under the generic description, "pyrophoric liquids, n.o.s."

Sections 179.400 and 179.401 have been expanded to provide for the construction of class 113AW tank cars for liquefied ethylene service, and to provide for advancements in engineering and design of tank cars for the transportation of liquefied hydrogen.

In § 179.500, editorial changes have been made to subsections 3, 6, 8, 10, 12, and 17. Subsection 4 has been modified to assure that the cylinder shell is not reduced during forming below specification requirements. Subsection 7 has been retitled and provisions inserted to rely upon the requirements for test specimens prepared in accordance with Appendix W of the AAR Specifications for Tank Cars. In subsection 17, the size of letters has been reduced to 1½ inches to be uniform with other marking requirements. Throughout Part 179, editorial changes have been made to the marking requirements for tank cars to substitute the letters "DOT" for "ICC" and "Department" for "Commission."

This amendment is proposed under the authority of sections 831-835, title 18, United States Code, section 9 of the Department of Transportation Act (49 U.S.C. 1657), and § 1.4(d)(6) of the regulations of the Office of the Secretary of Transportation.

In consideration of the foregoing it is proposed to amend Title 49 of the Code of Federal Regulations as hereinafter set forth.

Issued in Washington, D.C., on November 13, 1968.

A. SHEFFER LANG,
Administrator,

Federal Railroad Administration.

I. Part 173 would be amended as follows:

(A) By amending subparagraph (a)(5) with no change in note 1 in § 173.124 to read as follows:

§ 173.124 Ethylene oxide.

(a) * * *

(5) Spec. 105A100,¹ 105A100W, 111A100W4, or ARA-A-IV¹ (§§ 179.100, 179.101, 179.200, 179.261 of this chapter). Tank cars. Specs. 105A200W, 105A300W, 105A400W, 105A500W, and 105A600W (§§ 179.100 and 179.161 of this chapter) must be restenciled 105A100W and be equipped with safety valves of the type and size used in spec. 105A100W tank cars. Openings in tank heads to facilitate application of nickel lining are authorized and must be closed in an approved manner. See Note 1 of § 173.119(f)(3). (See § 173.432 for shipping instructions.) Tank jacket shall be stenciled on both sides in letters not less than one and one-half inches high "For Ethylene Oxide Only."

* * *

(B) By amending subparagraph (b) (2) of § 173.264 to read as follows:

§ 173.264 Hydrofluoric acid.

(b) * * *

(2) Spec. 105A300W, 112A400W, or ARA-V¹ (§§ 179.100, 179.101 of this chapter). Tank cars equipped with special valves and appurtenances approved for this particular service. Filling density must not exceed 90 percent of the pounds water weight capacity of the tank. For safety relief valve see § 179.100-15 (b) and (c).

(C) By amending subparagraph (c) (2) of § 173.268 to read as follows:

§ 173.268 Nitric acid.

(c) * * *

(2) Spec. 103A-ALW (§§ 179.200, 179.201 of this chapter). Tank car. Bottom washout or bottom outlet is prohibited unless effectively sealed with an approved arrangement to prevent use. Safety vent is prohibited.

(D) By amending paragraph (c) table, Notes 6, 12, and 17 of § 173.314 as follows:

§ 173.314 Requirements for compressed gases in tank cars.

(c) * * *

NOTE 6: Tank shall be insulated with an approved material of sufficient thickness so that the thermal conductance at 60° F. is not more than 0.03 B.t.u. per hour per square foot per degree F. temperature differential; except that in order to permit an anchorage which shall not exceed 7 inches from top of center sills to bottom of tank, the insulation thickness directly over the sills may be reduced to give thermal conductance not exceeding 0.04 B.t.u. per hour per square foot per degree F. temperature differential. Tank shall be equipped with one safety relief valve set for the start-to-discharge pressure listed in § 179.101, and one safety vent of approved design, set to function at a pressure less than the tank test pressure, but not less than 75 percent of tank test pressure. The discharge capacity of each of these safety relief devices shall be sufficient to prevent building up pressure in tank in excess of 82½ percent of the tank test pressure. Each tank shall be equipped with two pressure-regulating valves of approved design, set to open at a pressure not exceeding 350 p.s.i. on spec. 105A500W tanks or 400 p.s.i. on spec. 105A600W tanks. Each regulating valve and safety relief device shall have its final discharge piped to the outside of the protective housing.

NOTE 12: Special tank requirements applicable to chlorine see § 179.102. Nominal 16-, 30-, or 55-ton car tanks shall be loaded to the nominal weights with a tolerance of plus 0 minus 2 percent. Tanks shall be constructed in compliance with spec. 105A500W. Cars may be registered and jackets stenciled spec. 105A300W or 105A500W and equipped with a safety relief valve required by the specification to which registered. The interior pipes of liquid discharge valves shall be equipped

with excess flow valves of approved design. Insulation shall be 4 inches of corkboard or 4 inches of self-extinguishing polyurethane foam. Specs. 105A300 and 105A500 cars having forge-welded anchors must not be used for shipments of chlorine.

NOTE 17: Tank shall be insulated with an approved material of sufficient thickness so that the thermal conductance at 60° F. is not more than 0.03 B.t.u. per hour per square foot per degree F. temperature differential; except that in order to permit an anchorage which shall not exceed 7 inches from top of center sill to bottom of tank, the insulation thickness directly over the sills may be reduced to give thermal conductance not exceeding 0.04 B.t.u. per hour per square foot per degree F. temperature differential. Tank shall be equipped with one safety relief valve, set for the start-to-discharge pressure listed in § 179.101 of this chapter, and one safety vent of approved design, set to function at a pressure less than the tank test pressure, and not less than 75 percent of the tank test pressure. The discharge capacity of each of these safety relief devices shall be sufficient to prevent building up pressure in tank in excess of 82½ percent of the tank test pressure. Each safety relief device shall have its final discharge piped to the outside of the protective housing. The temperature of the vinyl fluoride, inhibited when the car is offered in transportation shall not exceed zero degrees F. and the pressure shall not exceed 105 p.s.i. The shipper shall notify the Bureau of Explosives, and the Bureau of Railroad Safety, Federal Highway Administration, whenever a car is not received by the consignee within 30 days from the date of shipment.

II. Part 179 would be amended as follows:

(A) The Table of Contents would be amended by amending Subparts C, D, and F Headings; by adding Subpart G Heading; by amending §§ 179.103, 179.400, 179.401, 179.500; by adding §§ 179.7, 179.220, 179.221 as follows:

Subpart C—Specifications for Pressure Tank Car Tanks (Classes 105A, 109A, 112A, 114A, 117A, and 120A)

Sec.

179.7 Matter incorporated by reference.
179.103 Special requirements for classes 114A, 117A, and 120A tank car tanks.

Subpart D—Specifications for Nonpressure Tank Car Tanks (Classes 103, 104, 111A, and 115A)

Sec.

179.220 General specifications for nonpressure tank car tanks consisting of an inner container supported within an outer shell (class 115A).
179.221 Individual specification requirements applicable to nonpressure tank car tanks consisting of an inner container supported within an outer shell.

Subpart F—Specifications for Liquefied Hydrogen Only or Liquefied Ethylene Only Tank Car Tanks (Class 113A)

Sec.

179.400 General specifications applicable to liquefied hydrogen only or liquefied ethylene only tank car tanks.
179.401 Individual specification requirements for liquefied hydrogen only or liquefied ethylene only tank car tanks.

Subpart G—Specifications for High Pressure Tank Car Tanks (Class 107A)

Sec.

179.500 Specifications applicable to DOT-107A * * *, seamless steel tank car tanks.

(B) By amending subparagraph (a) (4); by adding subparagraph (a) (11) in § 179.2 to read as follows:

§ 179.2 Definitions and abbreviations.

(a) * * *

(4) "DOT" and "Department" mean the Department of Transportation.

(11) "AAR Specifications for Tank Cars" means the (to be inserted) edition of the Specifications for Tank Cars published by the Association of American Railroads, 59 East Van Buren Street, Chicago, Ill. 60605.

§ 179.3 [Amended]

(C) By amending that portion of paragraphs (b) and (c) of § 179.3 now reading "Commission" to read "Department", and "ICC" to read "DOT".

§ 179.4 [Amended]

(D) By amending that portion of paragraph (b) of § 179.4 now reading "Commission" to read "Department".

§ 179.5 [Amended]

(E) By amending that portion of paragraph (b) of § 179.5 now reading "ICC" to read "DOT".

(F) By amending paragraph (a) of § 179.6 to read as follows:

§ 179.6 Repairs and alterations.

(a) For procedure to be followed in making repairs or alterations, see Appendix R of the AAR Specifications for Tank Cars.

(G) By adding § 179.7 to read as follows:

§ 179.7 Matter incorporated by reference.

(a) *Incorporation.* There are hereby incorporated by reference, into this part, all materials referred to in this part that are not set forth in full in this part. These materials are hereby made a part of the regulation in this part. Materials subject to change are incorporated as they are in effect on the date of adoption of the amendment that incorporates them, unless the reference to them provides otherwise.

(b) All incorporated materials are available for inspection in the Office of Hazardous Materials, 400 Sixth Street SW., Washington, D.C. In addition, materials incorporated by reference are available as follows:

(1) AAR Specifications for Tank Cars and other AAR publications—Association of American Railroads, 59 East Van Buren Street, Chicago, Ill. 60605.

(2) ASME Boiler and Pressure Vessel Code Section VIII, and other ASME publications—American Society of Mechanical Engineers, 29 West 39th Street, New York, N.Y. 10018.

(3) ASTM Specification E-23-64, and other ASTM publications—American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pa. 19103.

(H) By adding a new footnote 1 to paragraph (b) table in § 179.12-2; redesignating footnote 1 as footnote 2; add footnote reference 1 in first line, center column and change reference second line to read 2 as follows:

§ 179.12-2 Materials and dimensions.

(b) * * *

¹ When welded joints are used a 20 percent reduction in minimum thickness is permitted.

² Nominal thickness.

(I) By amending Subpart C heading as follows:

Subpart C—Specifications for Pressure Tank Car Tanks (Classes 105A, 109A, 112A, 114A, 117A, and 120A)

(J) By amending the heading of § 179.100-1; amending paragraph (a) of § 179.100-3; amending paragraph (a) of § 179.100-4; amending paragraph (a) of § 179.100-6; amending paragraphs (a) and (b) of § 179.100-7; amending paragraph (a) of § 179.100-12; amending the introductory text of paragraph (a) and subparagraphs (a) (1) and (3), redesignating subparagraph (a) (5) as (a) (6), and adding a new paragraph (a) (5) in § 179.100-14; amending paragraphs (a), (b), and (c) of § 179.100-15; changing first line of second column of Example paragraph (a) from "ICC" to "DOT" § 179.100-20 as follows:

§ 179.100-1 Tanks built under these specifications shall meet with the requirements of §§ 179.100, 179.101 and, when applicable, §§ 179.102, 179.103, and 179.104.

§ 179.100-3 Type.

(a) Tanks built under this specification shall be fusion-welded with heads designed convex outward. Except as provided in § 179.103 or § 179.104, they shall be circular in cross section; shall be provided with a manway nozzle on top of the tank of sufficient size to permit access to the interior, a manway cover to provide for the mounting of all valves, measuring and sampling devices, and a protective housing. Other openings in the tank are prohibited, except as provided in Part 173 of this chapter, §§ 179.100-14, 179.101-1 table, (footnote 10, § 179.102-12 or § 179.103.

§ 179.100-4 Insulation.

(a) If insulation is applied, the tank shell and manway nozzle shall be insulated with an approved material. The entire insulation shall be covered with a metal jacket of thickness not less than 11 gauge (0.1196 inch) nominal (Manufacturer's Standard Gauge, AISI) and flashed around all openings so as to be weather tight. The exterior surface of a carbon steel jacket and the inside surface of a carbon steel jacket shall be given

a protective coating except that protective coating is not required when foam-in-place insulation that adheres to the tank or jacket is applied.

§ 179.100-6 Thickness of plates.

(a) The wall thickness after forming of the tank shell and heads shall not be less than that specified in § 179.101, nor that calculated by the following formula:

$$t = \frac{Pd}{2SE}$$

where:

d = Inside diameter in inches;
 E = 1.0 welded joint efficiency; except for heads with seams = 0.9;
 P = Minimum required bursting pressure in p.s.i.;
 S = Minimum tensile strength of plate material in p.s.i., as prescribed in AAR Specifications for Tank Cars, Appendix M;
 t = Minimum thickness of plate in inches after forming.

§ 179.100-7 Materials.

(a) Carbon steel plate used to fabricate tank shell and manway nozzle shall be as specified in AAR Specifications for Tank Cars, Appendix M, Section M3.01.

(b) Aluminum alloy plate used to fabricate tank shell and manway nozzle shall be as specified in AAR Specifications for Tank Cars, Appendix M, Section M3.02.

§ 179.100-12 Manway nozzle, cover and protective housing.

(a) Manway nozzles shall be of approved design of forged or rolled steel for steel tanks or fabricated aluminum alloy for aluminum tanks, with access opening at least 18 inches inside diameter, or at least 14 inches by 18 inches obround or oval. Nozzle shall be welded to the tank and the opening reinforced in an approved manner in compliance with the requirements of AAR Specifications for Tank Cars, Appendix E, Figure E10.

§ 179.100-14 Bottom outlets.

(a) Bottom outlets for discharge of lading are prohibited, except as provided in § 179.103. If indicated in § 179.101, tank may be equipped with a bottom washout of approved construction. If applied, bottom washout shall be in accordance with the following requirements:

(1) On newly built and empty cars with truck centers through 60 feet, 6 inches the extreme projection of the bottom outlet equipment shall be at least 12 inches above the top of rail on level track. On cars with truck centers greater than 60 feet, 6 inches the minimum rail clearance shall be in accordance with the graph in Appendix E of the AAR Specifications for Tank Cars. All bottom outlet reducers and closures and their attachments shall be secured to car by at least $\frac{3}{8}$ -inch chain or its equivalent, except that outlet closure plugs may be attached by $\frac{1}{4}$ -inch chain. When the bottom outlet closure is of the combina-

tion cap and valve type, the pipe connection to the valve shall be closed by a plug, cap, or approved quick-coupling device.

(3) If bottom washout nozzle extends 6 inches or more from shell of tank, a V groove shall be cut (not cast) in the upper part of the nozzle at a point immediately below the lowest part of inside closure seat or plug to a depth that will leave wall thickness of nozzle at the root of the V not over one-fourth inch. Where nozzle is not a single piece, provision shall be made for the equivalent of the breakage groove. The nozzle shall be of a thickness to insure that accidental breakage will occur at or below the V groove or its equivalent.

(5) The closure of the washout nozzle must be equipped with a $\frac{3}{4}$ -inch solid screw plug. Plug must be attached by at least a $\frac{1}{4}$ -inch chain.

(6) Joints between closures and their seats may be gasketed with suitable material.

§ 179.100-15 Safety relief valves.

(a) The tank shall be equipped with one or more safety relief valves of approved design, made of metal not subject to rapid deterioration by the lading. The safety relief valve, or valves, shall be mounted on manway cover, except as provided in § 179.103. The total valve discharge capacity shall be sufficient to prevent building up pressure in tank in excess of 82½ percent of the tank test pressure or 10 p.s.i. above the start-to-discharge pressure, whichever is larger. The start-to-discharge and vapor-tight pressures shall comply with § 179.101 and shall not be affected by any auxiliary closure or other combination. For certain commodities, alternate pressures are permitted (see § 179.102-11). See AAR Specifications for Tank Cars, Appendix A, for formula for calculating discharge capacity.

(b) When a safety relief valve is used in combination with a breaking pin device, the breaking pin device shall be designed to fail at a pressure of 75 percent of the tank test pressure and safety relief valve shall be set for a start-to-discharge pressure of 71 percent of the tank test pressure as prescribed in § 179.101.

(c) When a safety relief valve is used in combination with a frangible disc, the frangible disc shall be designed to burst at a pressure of 75 percent of the tank test pressure and the safety relief valve shall be set for a start-to-discharge pressure of 213 p.s.i. on a DOT-105A300-W tank, 360 p.s.i. on a DOT-105A500-W tank, or 284 p.s.i. on DOT-112A400-W and DOT-114A400-W tanks. Provision shall be made to prevent any accumulation of pressure between the frangible disc and safety relief valve.

(K) By amending Table of paragraph (a), in its entirety, in § 179.101-1 to read as follows:

§ 179.101-1 Individual specification requirements.

(a) * * *

| DOT specifications | 105A100W | 105A200F | 105A200W | 105A300W | 105A400W | 105A500W | 105A600W | 105A100ALW |
|---------------------------------------------------------------------------|--------------------------------------|----------------------|------------------------|--------------------------------------------------------------------------------------------------------|----------------|----------------------------------------------------------------|----------------------------------------------------------------|----------------|
| Material (see § 179.100-7) | Steel | Steel | Steel | Steel | Steel | Steel | Steel | Aluminum |
| Insulation (see § 179.100-4) | Required | Required | Required | Required | Required | Required | Required | Required |
| Bursting pressure p.s.i. (see § 179.100-5) | 500 | 500 | 500 | 750 | 1000 | 1250 | 1500 | 500 |
| Minimum plate thickness, inches, shell and heads | $\frac{3}{16}$ | $\frac{3}{16}$ | $\frac{3}{16}$ | $\frac{1}{2}$ | $\frac{1}{2}$ | $\frac{1}{2}$ | $\frac{1}{2}$ | $\frac{5}{16}$ |
| Test pressure, p.s.i. (see § 179.100-18) | 100 | See § 179.104 | 200 | 300 | 400 | 500 | 600 | 100 |
| Safety relief valves, p.s.i.: ⁶ Start-to-discharge pressure | 75 | 150 | 150 | 225 | 300 | 375 | 450 | 75 |
| Start-to-discharge tolerance | ±3.0 | ±4.5 | ±4.5 | ±6.75 | ±9.0 | ±11.25 | ±13.5 | ±3.0 |
| Vapor tight (minimum) pressure | 60 | 120 | 120 | 180 | 240 | 300 | 360 | 60 |
| Valve flow rating pressure (maximum p.s.i.) | 85 | 165 | 165 | 247.5 | 330 | 412.5 | 495 | 85 |
| Manway cover, thickness, inches (minimum) | $2\frac{1}{4}$ | $2\frac{1}{4}$ | $2\frac{1}{4}$ | $2\frac{1}{4}$ | $2\frac{1}{4}$ | $2\frac{1}{4}$ | $2\frac{1}{4}$ | $2\frac{1}{2}$ |
| Special references | 179.102-3 179.102-6 179.102-12 | 179.102-3 179.104 | 179.102-3 179.102-6 | 179.102-2 179.102-3 179.102-5 179.102-6 179.102-7 179.102-8 179.102-11 179.102-13 | 179.102-3 | 179.102-1 179.102-2 179.102-3 179.102-9 179.102-10 | 179.102-1 179.102-3 179.102-4 179.102-9 179.102-10 | 179.102-3 |
| Bottom washout | Prohibited | Prohibited | Prohibited | Prohibited | Prohibited | Prohibited | Prohibited | Prohibited |
| Bottom outlet | do | do | do | do | do | do | do | Do. |

| | 105A200ALW | 105A300ALW | 109A300W | 109A100ALW | 109A200ALW | 109A300ALW | 112A200W | 112A340W |
|---------------------------------------------------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|-------------------------|----------------------------------------|
| Material (see § 179.100-7) | Aluminum | Aluminum | Steel | Aluminum | Aluminum | Aluminum | Steel | Steel |
| Insulation (see § 179.100-4) | Required | Required | Optional | Optional | Optional | Optional | None ⁴ | None ⁴ |
| Bursting pressure p.s.i. (see § 179.100-5) | 500 | 750 | 750 | 500 | 500 | 750 | 500 | 850 |
| Minimum plate thickness, inches, shell and heads | $\frac{5}{16}$ | $\frac{5}{16}$ | $\frac{1}{2}$ | $\frac{5}{16}$ | $\frac{5}{16}$ | $\frac{5}{16}$ | $\frac{3}{16}$ | $\frac{1}{2}$ |
| Test pressure, p.s.i. (see § 179.100-18) | 200 | 300 | 300 | 100 | 200 | 300 | 200 | 340 |
| Safety relief valves, p.s.i.: ⁶ Start-to-discharge pressure | 150 | 225 | 225 | 75 | 150 | 225 | 150 | 255 |
| Start-to-discharge tolerance | ±4.5 | ±6.75 | ±6.75 | ±3.0 | ±4.5 | ±6.75 | ±4.5 | ±7.65 |
| Vapor tight (minimum) pressure | 120 | 180 | 180 | 60 | 120 | 180 | 120 | 204 |
| Valve flow rating pressure (maximum p.s.i.) | 165 | 247.5 | 247.5 | 85 | 165 | 247.5 | 165 | 280.5 |
| Manway cover, thickness, inches (minimum) | $2\frac{1}{2}$ | $2\frac{5}{8}$ | $2\frac{1}{4}$ | $2\frac{1}{2}$ | $2\frac{1}{2}$ | $2\frac{5}{8}$ | $2\frac{1}{4}$ | $2\frac{1}{4}$ |
| Special references | 179.102-3 | 179.102-3 | | | | | 179.102-3 ¹⁰ | 179.102-3, ¹⁰ 179.102-11 |
| Bottom washout | Prohibited | Prohibited | Optional | Optional | Optional | Optional | Prohibited | Prohibited |
| Bottom outlet | do | do | Prohibited | Prohibited | Prohibited | Prohibited | do | Do. |

| | 112A400W | 112A500W | 114A340W | 114A400W | 117A340W | 120A300W | 112A400F ¹¹ |
|---------------------------------------------------------------------------|------------------------------------------------------------------|-------------------------|-----------------------|-------------------------------------|-----------------------|-----------------------|------------------------|
| Material (see § 179.100-7) | Steel | Steel | Steel | Steel | Steel | Steel | Steel |
| Insulation (see § 179.100-4) | None ⁴ | None ⁴ | None ⁴ | None ⁴ | None ⁴ | None ⁴ | Required |
| Bursting pressure p.s.i. (see § 179.100-5) | 1000 | 1250 | 850 | 1000 | 1000 | 850 | 750 |
| Minimum plate thickness, inches, shell and heads | $\frac{1}{2}$ | $\frac{1}{2}$ | $\frac{1}{2}$ | $\frac{1}{2}$ | $\frac{1}{2}$ | $\frac{1}{2}$ | $\frac{1}{2}$ |
| Test pressure, p.s.i. (see § 179.100-18) | 400 | 500 | 340 | 400 | 340 | 300 | |
| Safety relief valves, p.s.i.: ⁶ Start-to-discharge pressure | 300 | 375 | 255 | 300 | 255 | 225 | |
| Start-to-discharge tolerance | ±9.0 | ±11.25 | ±7.65 | ±9.0 | ±7.65 | ±6.75 | |
| Vapor tight (minimum) pressure | 240 | 300 | 204 | 240 | 204 | 180 | |
| Valve flow rating pressure (maximum p.s.i.) | 330 | 412.5 | 280.5 | 330 | 280.5 | 247.5 | |
| Manway cover, thickness, inches (minimum) | $2\frac{1}{4}$ | $2\frac{1}{4}$ | (?) | (?) | (?) | (?) | |
| Special references | 179.102-3 ¹⁰ 179.102-6 179.102-11 179.102-13 | 179.102-3 ¹⁰ | 179.102-11 179.103 | 179.102-11 179.102-13 179.103 | 179.102-11 179.103 | 179.102-11 179.103 | |
| Bottom washout | Prohibited | Prohibited | Optional | Optional | Optional | Optional | Prohibited |
| Bottom outlet | do | do | do | do | do | do | Do. |

¹ When steel of 65,000 to 81,000 p.s.i. minimum tensile strength is used, the thickness of plates shall be not less than $\frac{3}{16}$ inch, and when steel of 81,000 p.s.i. minimum tensile strength is used, the minimum thickness of plate shall be not less than $\frac{1}{4}$ inch.

² When approved material other than aluminum alloys are used, the thickness shall be not less than $2\frac{3}{4}$ inches.

³ When steel of 65,000 p.s.i. minimum tensile strength is used, minimum thickness of plates shall be not less than $\frac{1}{2}$ inch.

⁴ At least the upper two-thirds of the exterior of the tank, manway nozzle and all appurtenances in contact with this area of the tank shall have a finish coat of white paint.

⁵ For inside diameter of 87 inches or less, the thickness of plates shall be not less than $\frac{1}{2}$ inch.

⁶ See § 179.102 for optional setting for certain commodities.

⁷ See § 179.103-2.

⁸ (Purposefully left blank.)

⁹ When the use of nickel is required by the lading, the thickness shall be not less than 2 inches.

¹⁰ Each tank head may be equipped with not more than one opening for use in purging tank interior.

¹¹ Tanks converted to Spec. 112A400F from existing forge-welded Spec. 105A500 tanks by modification using conversion details complying with Spec. 112A400W specification requirements, shall be stenciled by substituting the letter "F" for the letter "W" in the specification designation.

(L) By amending § 179.102 as follows:

§ 179.102 Special commodity requirements for pressure tank car tanks.

(a) In addition to §§ 179.100 and 179.101 the following requirements are applicable:

(1) *Liquefied carbon dioxide*. Refer to § 173.314(c) table and Note 6 of this chapter. All plates for tank, manway, nozzle and anchorage of tanks used in the transportation of liquefied carbon dioxide shall be made of carbon steel complying with ASTM Specification A-300 (Class 1-63T) flange or firebox quality; using ASTM Specification A-201 Grade A, or ASTM Specification A-212 Grades A and B, or ASTM A-516 Grade 70. Impact test specimens made by the plate manufacturer shall be of the Charpy Keyhole notch type and shall meet impact requirements (in either longitudinal or transverse directions of rolling) of Section W9.00 of AAR Specifications for Tank Cars, Appendix W.

(2) *Chlorine*. Refer to § 173.314(c) table and notes 3 and 12 of this chapter. Tanks shall be fabricated from carbon steel complying with the requirements of § 179.100-7(a) to Specification ASTM A-516-1966 Grade 70 or AAR TC-128-1966, Grade A or B.

(3) *Liquefied flammable gases*. Refer to § 173.314(c) table and Note 4 of this chapter. The interior pipes of the loading and unloading valves, gauging device and sampling valve shall be equipped with excess flow valves of an approved design. The protective housing cover shall be equipped with an approved weatherproof cover over an opening having an unrestricted area at least equal to the total safety relief valve discharge area.

(4) *Vinyl fluoride*. Refer to § 173.314(c) table and Note 17 of this chapter.

(5) *Nitrosyl chloride*. Refer to § 173.314(c) table and Notes 10 and 11 of this chapter.

(6) *Vinyl chloride or vinyl methyl ether, inhibited*. Refer to § 173.314(c) table and Notes 4, 9, and 16 of this chapter. For alternate safety relief valve settings see subparagraph (11) of this paragraph.

(7) *Bromine*. Refer to § 173.252(a) (3) of this chapter.

(8) *Motor fuel antiknock compound*. Refer to § 173.354(a) (4) of this chapter.

(9) *Nitrogen tetroxide or nitrogen tetroxide-nitric oxide mixtures*. Refer to §§ 173.336(a) (4) and 173.338(a) (4) of this chapter.

(10) *Hydrocyanic acid*. Refer to § 173.332(d) of this chapter.

(11) *Liquefied petroleum gas, butadiene, anhydrous ammonia or vinyl chloride*. As an alternate to the safety relief valve settings prescribed in § 179.101-1 safety relief valves may be set to the following pressures provided the total valve discharge capacity is sufficient to prevent building up pressure in the tank in excess of 90 percent of the tank test pressure.

| DOT specifications | 105A300W 120A300W | 112A340W 114A340W 117A340W | 112A400W 114A400W |
|---------------------------------|----------------------|----------------------------------|----------------------|
| Safety relief valves, p.s.i.: | | | |
| Start-to-discharge pressure... | 247.5 | 280.5 | 330 |
| Start-to-discharge tolerance... | ±7.4 | ±8.4 | ±10 |
| Vapor tight pressure (minimum). | 196 | 224 | 264 |

(12) *Ethylene oxide*. Refer to § 173.124(a) (5) of this chapter.

(13) *Anhydrous hydrofluoric acid*. Refer to § 173.264(b) (2) of this chapter.

(14) *Hydrogen sulfide*. Spec. 105A 600W tank cars used to transport hydrogen sulfide shall comply with the following special requirements:

(i) No welding or welding repairs are permitted on the tank shell, heads, or manway nozzle after the tank is stress relieved. When such welding is necessary, the tank shall be stress relieved as a unit after welding is completed. Welding after stress relieving is permitted only to external pads which have been welded in place prior to stress relieving.

(ii) Tanks shall be stress relieved at 1,100° F. minimum; stress relief at alternate lower temperatures to AAR Appendix W, W17.02(e) is prohibited.

(iii) Plates for the tank shell, heads and manway shall comply with specifications ASTM A-516, Grade 70; or ASTM A-537, Grade A.

(iv) Manway stud and nut material shall comply with AAR Appendix M, M4.02, modified by heat treatment to the following properties:

| | |
|----------------------|------------------------|
| Hardness ----- | RC 22 maximum. |
| Tensile strength---- | 90,000 p.s.i. minimum. |
| Yield strength----- | 75,000 p.s.i. minimum. |

(M) By amending the heading of § 179.103; add paragraphs (f), (g), and (h) to § 179.103-1; amend paragraph (a) of § 179.103-2; amend paragraphs (a) and (c) in § 179.103-3; add § 179.103-5 as follows:

§ 179.103 Special requirements for classes 114A, 117A, and 120A tank car tanks.

§ 179.103-1 Type.

(f) Class DOT 114A tank cars are uninsulated tank cars for the transportation of compressed gases as authorized in § 173.314 of this chapter.

(g) Class DOT 117A tank cars are dual service uninsulated tank cars for the transportation of compressed gases as authorized in § 173.314 of this chapter and/or flammable liquids as authorized in § 173.119 of this chapter and shall be stencilled with the name of the lading being transported.

(h) Class DOT 120A tank cars are dual service insulated tank cars for the transportation of compressed gases as authorized in § 173.314 of this chapter and/or flammable liquids as authorized in § 173.119 of this chapter and shall be

stencilled with the name of the lading being transported.

§ 179.103-2 Manway cover.

(a) Manway cover shall be of approved design and may be of the internal self-energizing type.

§ 179.103-3 Venting, loading and unloading valves, measuring and sampling devices.

(a) Venting, loading and unloading valves, measuring and sampling devices, when used, shall be attached to a nozzle or mounting plate or to nozzles or mounting plates on the tank shell or heads.

(c) When tank car is used to transport liquefied flammable gases, the interior pipes of the loading, unloading, and sampling valves shall be equipped with excess flow valves of approved design, except when quick closing internal valves of approved design are used. When the interior pipe of the gauging device provides a means for the passage of lading from the interior to the exterior of the tank, it shall be equipped with an excess flow valve of approved design or with an orifice not exceeding a No. 54 drill size.

§ 179.103-5 Bottom outlets.

(a) In addition to or in lieu of the venting, loading and unloading valves, measuring and sampling devices as prescribed in § 179.103-3, tanks may be equipped with approved bottom outlet valves. If applied, bottom outlet valve shall meet the following requirements:

(1) When external bottom outlet valve without interior pipes is used in liquefied flammable gas service, the valve shall be closed with an internal bolted or self-energizing closure of approved design.

(2) When internal bottom outlet valve is used in liquefied flammable gas service, the outlet of the valve shall be equipped with an excess flow valve of approved design, except when a quick closing internal valve of approved design is used.

(3) Bottom outlet valve shall be equipped with a liquid tight closure at its lower end.

(b) Bottom outlet equipment shall be of approved design and shall meet the following requirements:

(1) The extreme projection of bottom outlet equipment shall be at least 12 inches above top of rail.

(2) Bottom outlet shall be provided with a liquid tight closure at its lower end.

(3) The valve operating mechanism shall be provided with a suitable locking arrangement to insure positive closure during transit.

(4) If outlet nozzle extends 6 inches or more from shell of tank, a breakage groove or its equivalent shall be provided immediately below the lowest part of the valve. Breakage groove, if used, shall consist of a V groove cut (not cast) in the nozzle to depth that will leave thickness of nozzle wall at the root of the V not over one-fourth inch.

(5) The valve body shall be of a thickness which will insure that accidental breakage of the outlet nozzle will occur at or below the V groove, or its equivalent and will not cause distortion of the valve seat or valve.

(N) By amending Subpart D Heading to read as follows:

Subpart D—Specifications for Non-pressure Tank Car Tanks (Classes 103, 104, 111A, and 115A)

(O) By amending the heading of § 179.200-1; amend paragraph (a) of § 179.200-3; amend paragraph (a) of § 179.200-4; amend paragraphs (a), (b), redesignate paragraphs (c), (d), (e), (f), as (d), (e), (f), (g) respectively, add a new paragraph (c) in § 179.200-6; amend entire § 179.200-7; amend paragraph (c) § 179.200-15; add paragraph (f) in § 179.200-16; amend paragraphs (a) (1), (3), (6), (7), (b), (b) (1), (2), (3), redesignate (b) (5) as (b) (6), add a new paragraph (b) (5) in § 179.200-17; add paragraph (b) to § 179.200-24 as follows:

§ 179.200-1 Tanks built under these specifications shall meet the requirements of §§ 179.200, 179.201 and, when applicable, § 179.202.

§ 179.200-3 Type.

(a) Tanks built under these specifications shall be circular in cross section, with formed heads designed convex outward. When specified in § 179.201-1 tank shall have at least one manway or one expansion dome with manway, and such other external projections as are prescribed herein. When the tank is divided into compartments, each compartment shall be treated as a separate tank.

§ 179.200-4 Insulation.

(a) If insulation is applied, the tank shell and expansion dome when used shall be insulated with an approved material. The entire insulation shall be covered with a metal jacket of a thickness not less than 11 gauge (0.1196 inch) nominal (Manufacturer's Standard Gauge, AISI) and flashed around all openings so as to be weather tight. The exterior surface of a carbon steel tank and the inside surface of a carbon steel jacket shall be given a protective coating, except that protective coating is not required when foam-in-place insulation that adheres to the tank or jacket is applied.

§ 179.200-6 Thickness of plates.

(a) The wall thickness after forming of the tank shell, dome shell, and of 2:1 ellipsoidal heads shall not be less than specified in § 179.201-1, nor that calculated by the following formula:

$$t = \frac{Pd}{2SE}$$

where:

d =Inside diameter in inches;
 E =0.9 welded joint efficiency; except $E=1.0$ for seamless heads;
 P =Minimum required bursting pressure in p.s.i.;
 S =Minimum tensile strength of plate material in p.s.i. as prescribed in AAR Specifications for Tank Cars, Appendix M, Table M-1;
 t =Minimum thickness of plate in inches after forming.

(b) The wall thickness after forming of 3:1 ellipsoidal heads shall not be less than specified in § 179.201-1, nor that calculated by the following formula:

$$t = \frac{Pd}{2SE} \times 1.83$$

where:

d =Inside diameter in inches;
 E =0.9 welded joint efficiency; except $E=1.0$ for seamless heads;
 P =Minimum required bursting pressure in p.s.i.;
 S =Minimum tensile strength of plate material in p.s.i. as prescribed in AAR Specifications for Tank Cars, Appendix M, Table M-1;
 t =Minimum thickness of plate in inches after forming.

(c) The wall thickness after forming of a dished head shall be not less than specified in § 179.201-1, nor that calculated by the following formula:

$$t = \frac{5PL}{6SE}$$

where:

E =0.9 welded joint efficiency; except $E=1.0$ for seamless heads;
 L =Main inside radius to which head is dished, measured on concave side in inches;
 P =Minimum required bursting pressure in p.s.i.;
 S =Minimum tensile strength of plate material in p.s.i. as prescribed in AAR Specifications for Tank Cars, Appendix M, Table M-1;
 t =Minimum thickness of plate in inches after forming.

§ 179.200-7 Materials.

(a) Plate material used to fabricate tank shell and, when used, expansion dome or manway nozzle shall be as specified in AAR Specifications for Tank Cars, Appendix M, sections M300, M301, M302, and M304.

(b) All parts and items of construction in contact with the lading shall be made of material compatible with plate material and not subject to rapid deterioration by the lading, or be coated or lined with suitable corrosion resistant material.

(c) All external projections which may be in contact with the lading and all castings, forgings or fabrications used for fittings or attachments to tank and expansion dome, when used, in contact with lading shall be made of material to an approved specification. Use of cast iron is prohibited for class DOT-111A cars.

§ 179.200-15 Closures for manways.

(c) Manway covers shall be of approved cast, forged or fabricated metals. Malleable iron, if used, shall comply with ASTM A-47. Cast iron manway covers shall not be used.

§ 179.200-16 Gauging devices, top loading and unloading devices, venting and air inlet devices.

(f) When top loading and discharge devices, or venting and air inlet devices are installed with exposed piping to a removed location, shutoff valves shall be applied directly to reinforcing pads or nozzles at their communication through the tank shell, and shall be inclosed in a protective housing with provision for a seal. The piping shall include breakage grooves and suitable bracing. Relief valves shall be applied to liquid lines for protection in case lading is trapped. Provision shall be made to insure closure of the valves while the car is in transit.

§ 179.200-17 Bottom outlets.

(a) * * *

(1) On newly built and empty cars with truck centers through 60 feet, 6 inches the extreme projection of the bottom outlet equipment shall be at least 12 inches above the top of rail on level track. On cars with truck centers greater than 60 feet, 6 inches the minimum rail clearance shall be in accordance with the graph in Appendix E of the AAR Specifications for Tank Cars. All bottom outlet reducers and closures and their attachments shall be secured to car by at least 3/8-inch chain or its equivalent, except that outlet closure plugs may be attached by 1/4-inch chain. When the bottom outlet closure is of the combination cap and valve type, the pipe connection to the valve shall be closed by a plug, cap, or approved quick-coupling device.

(3) On cars with center sills a ball valve may be welded to the outside bottom of the tank or mounted on a pad or nozzle with a tongue and groove or male and female flanged attachment, but in no case shall the breakage groove or equivalent extend below the bottom flange of the center sill. On cars without a continuous center sill a ball valve may be welded to the outside bottom of the tank or mounted with a tongue and groove or male and female flanged attachment on a pad attached to the outside bottom of the tank. The mounting pad shall have a maximum thickness of 2 1/2 inches measured on the longitudinal centerline of the tank. The valve operating mechanism when applied shall not extend more than 30 inches transversely from the longitudinal centerline of car and shall be provided with a suitable

locking arrangement to insure positive closure during transit.

(6) To provide for the attachment of unloading connections, the bottom of the main portion of the outlet nozzle or valve body of exterior valves, or some fixed attachment thereto, shall be provided with threaded closure arrangement or bolted flange closure arrangement having minimum 1-inch threaded pipe plug or approved quick coupling device. When two piece quick-coupling devices (e.g., adapter and dust cap) are used on bottom outlet extensions, an auxiliary valve shall be applied between the bottom outlet valve and the quick coupling. The quick-coupling closure (dust cap) or outlet nozzle wall shall be fitted with a minimum 1-inch threaded plug. The auxiliary valve may be omitted when the quick-coupling adapter is threaded internally and fitted with a minimum 1-inch plug.

(7) If outlet nozzle extends 6 inches or more from shell of tank a V groove shall be cut (not cast) in the upper part of outlet nozzle at a point immediately below lowest part of valve to a depth that will leave thickness of nozzle wall at the root of the V not over three-eighths inch for cast iron or one-fourth inch for all other materials. The outlet nozzle on interior valves or the valve body on exterior valves may be steam jacketed, in which case the breakage groove or its equivalent shall be below the steam chamber but above the bottom of center sill construction. If outlet nozzle is not a single piece, or if exterior valves are ap-

plied, provision shall be made for the equivalent of the breakage groove. On cars without continuous center sills, the breakage groove or its equivalent shall not be more than 15 inches below the tank shell.

(b) If indicated in § 179.201-1, tank may be equipped with bottom washout of approved construction. If applied, bottom washout shall be in accordance with the following requirements:

(1) On newly built and empty cars with truck centers through 60 feet, 6 inches the extreme projection of the bottom washout equipment shall be at least 12 inches above the top of rail on level track. On cars with truck centers greater than 60 feet, 6 inches the minimum rail clearance shall be in accordance with the graph in Appendix E of the AAR Specifications for Tank Cars.

(2) Bottom washout shall be of cast, forged, or fabricated metal. If welded to tank, the bottom washout shall be of good weldable quality in conjunction with metal of tank.

(3) If washout nozzle extends 6 inches or more from shell of tank, a V groove shall be cut (not cast) in the upper part of the nozzle at a point immediately below the lowest part of inside closure seat or plug to a depth that will leave wall thickness of nozzle at the root of the V not over three-eighths inch for cast iron or one-fourth inch for all other material. Where nozzle is not a single piece, provisions shall be made for the equivalent of the breakage groove. The nozzle shall be of a thickness

to insure that accidental breakage will occur at or below the V groove or its equivalent. On cars without continuous center sills, the breakage groove or its equivalent shall not be more than 15 inches below the tank shell.

(5) The closure of the washout nozzle must be equipped with a 3/4-inch solid screw plug. Plug must be attached by at least a 1/4-inch chain.

(6) Joints between closures and their seats may be gasketed with suitable material.

§ 179.200-24 Stamping.

(b) On DOT-111A type tank cars, the last numeral of the specification number may be omitted from the stamping: for example, "DOT 111A100".

(P) By amending paragraph (a) table in § 179.201-1 in its entirety; amend paragraph (a) in § 179.201-2; amend paragraph (a), redesignate paragraph (b) as paragraph (c), add new paragraphs (b) and (d) in § 179.201-3; amend paragraph (a) in § 179.201-4; amend paragraph (a) in § 179.201-5; amend paragraph (c) in § 179.201-6; amend paragraph (a), delete paragraphs (b) and (c) in § 179.201-7 as follows:

§ 179.201-1 Individual specifications requirements.

(a) In addition to § 179.200 the individual specification requirements are as follows:

| DOT specifications | 103A-ALW | 103AW | 103ALW | 103ANW | 103BW | 103CW | 103DW |
|--------------------------------------------------------------|-----------------------------|-----------------------------|--------------------|-----------------------------|-----------------------------|-----------------------------|---------------------|
| Material (see § 179.200-7) | A1 Alloy | Steel | A1 Alloy | Nickel | Steel | Alloy steel | Alloy steel. |
| Insulation (see § 179.200-4) | Optional | Optional | Optional | Optional | Optional | Optional | Optional. |
| Bursting pressure p.s.i. (see § 179.200-5) | 240. | 240. | 240. | 240. | 240. | 240. | 240. |
| Minimum plate thickness inches: | | | | | | | |
| Shell (see § 179.200-6) | 1/2 | 179.201-2 | 1/2 | 179.201-2 | 179.201-2 | 179.201-2 | 179.201-2. |
| Heads (see § 179.200-6 and § 179.200-8) | 1/2 | 179.201-2 | 1/2 | 179.201-2 | 179.201-2 | 179.201-2 | 179.201-2. |
| Dome | Required | Required | Required | Required | Required | Required | Required. |
| Minimum expansion capacity (see § 179.200-14) | 1 percent in dome. | 1 percent in dome. | 2 percent in dome. | 1 percent in dome. | 1 percent in dome. | 1 percent in dome. | 2 percent in dome. |
| Test pressure p.s.i. (see § 179.200-22) | 60. | 60. | 60. | 60. | 60. | 60. | 60. |
| Safety relief devices (see § 179.200-18) | Valve or vent | 179.201-7 | Valve or vent | 179.201-7 | Vent | Valve | Valve or vent. |
| Valve start-to-discharge pressure p.s.i. (±3 p.s.i.) | 35. | 35. | 35. | 35. | 35. | 35. | 35. |
| Valve vapor tight pressure (minimum p.s.i.) | 28. | 28. | 28. | 28. | 28. | 28. | 28. |
| Valve flow rating pressure (maximum p.s.i.) | 45. | 45. | 45. | 45. | 45. | 45. | 45. |
| Vent bursting pressure (maximum p.s.i.) | 45. | 45. | 45. | 45. | 45. | 45. | 45. |
| Gauging devices (see § 179.200-16) | Optional | Optional | Optional | Optional | Optional | Optional | Optional. |
| Top loading and unloading devices (see § 179.200-16) | Required (valves optional). | Required (valves optional). | do. | Required (valves optional). | Required (valves optional). | Required (valves optional). | Do. |
| Bottom outlet (see § 179.200-17(a)) | Prohibited | Prohibited | do. | Prohibited | Prohibited | Prohibited | Do. |
| Bottom washout (see § 179.200-17(b)) | Optional | Optional | do. | Optional | do. | do. | Do. |
| Closure for manway (see § 179.200-15) | | | 179.201-6(a) | 179.201-6(d) | 179.201-6(b) | 179.201-6(c) | 179.201-6 (a), (c). |
| Stress relief (SR) or heat treatment (HT) (see § 179.200-11) | Prohibited | SR | Prohibited | Not required | SR | HT (179.201-5) | HT (179.201-5). |
| Other requirements | | | | | 179.201-3 | 179.201-4 | |

| DOT specifications | 103EW | 103W | 104W | 111A60ALW1 | 111A60ALW2 | 111A60W1 ¹ | 111A100W1 ¹ |
|--------------------------------------------------------------|----------------------------|----------------------------|-------------------------------------|---------------------------------------------------------------------------|----------------------------|----------------------------|-------------------------------------|
| Material (see § 179.200-7) | Alloy steel | Steel | Steel | A1 Alloy | A1 Alloy | Steel | Steel |
| Insulation (see § 179.200-4) | Optional | Optional | Required | Optional | Optional | Optional | Optional |
| Bursting pressure p.s.i. (see § 179.200-5) | 240 | 240 | 240 | 240 | 240 | 240 | 500 |
| Minimum plate thickness inches: | | | | | | | |
| Shell (see § 179.200-6) | 179.201-2 | 179.201-2 | 179.201-2 | 1/2 | 1/2 | 1/2 | 1/2 |
| Heads (see § 179.200-6 and § 179.200-8) | 179.201-2 | 179.201-2 | 179.201-2 | 1/2 | 1/2 | 1/2 | 1/2 |
| Dome | Required | Required | Required | None | None | None | None |
| Minimum expansion capacity (see § 179.200-4) | 1 percent in dome | 2 percent in dome | 2 percent in dome | 2 percent in tank | 1 percent in tank | 2 percent in tank | 2 percent in tank |
| Test pressure p.s.i. (see § 179.200-22) | 60 | 60 | 60 | 60 | 60 | 60 | 100 |
| Safety relief devices (see § 179.200-18) | Valve or vent | Valve or vent | Valve or vent | Valve or vent | Valve or vent | Valve or vent | Valve or vent |
| Valve start-to-discharge pressure p.s.i. (±3 p.s.i.) | 35 | 35 | 35 | 35 | 35 | 35 | 75 |
| Valve vapor tight pressure (minimum p.s.i.) | 28 | 28 | 28 | 28 | 28 | 28 | 60 |
| Valve flow rating pressure (maximum p.s.i.) | 45 | 45 | 45 | 45 | 45 | 45 | 85 |
| Vent bursting pressure (maximum p.s.i.) | 45 | 45 | 45 | 45 | 45 | 45 | 75 |
| Gauging devices (see § 179.200-16) | Optional | Optional | Optional | Required | Required | Required | Required |
| Top loading and unloading devices (see § 179.200-16) | Required (valves optional) | do | do | Optional | Required (valves optional) | Optional | Optional |
| Bottom outlet (see § 179.200-17(a)) | Prohibited | do | do | do | Prohibited | do | Do |
| Bottom washout (see § 179.200-17(b)) | Optional | do | do | do | Optional | do | Do |
| Closure for manway (see § 179.200-15) | 179.201-6(c) | 179.201-6(a) | 179.201-6(a) | 179.201-6(a) | 179.201-6(a) | 179.201-6(a) | 179.201-6(a) |
| Stress relief (SR) or heat treatment (HT) (see § 179.200-11) | HT (179.201-5) | SR | SR | Prohibited | Prohibited | SR | SR |
| Other requirements | | | | | | | |
| | 111A60W2 | 111A60W5 | 111A60W7 | 111A100ALW1 | 111A100ALW2 | 111A100W2 ¹ | 111A100W3 |
| Material (see § 179.200-7) | Steel | Steel | Alloy steel | A1 alloy | A1 alloy | Steel | Steel |
| Insulation (see § 179.200-4) | Optional | Optional | Optional | Optional | Optional | Optional | Required |
| Bursting pressure p.s.i. (see § 179.200-5) | 240 | 240 | 240 | 500 | 500 | 500 | 500 |
| Minimum plate thickness inches: | | | | | | | |
| Shell (see § 179.200-6) | 1/2 | 1/2 | 1/2 | 5/8 | 5/8 | 1/2 | 1/2 |
| Heads (see § 179.200-6 and § 179.200-8) | 1/2 | 1/2 | 1/2 | 5/8 | 5/8 | 1/2 | 1/2 |
| Dome | None | None | None | None | None | None | None |
| Minimum expansion capacity (see § 179.200-4) | 1 percent in tank | 1 percent in tank | 1 percent in tank | 2 percent in tank | 1 percent in tank | 1 percent in tank | 2 percent in tank |
| Test pressure p.s.i. (see § 179.200-22) | 60 | 60 | 60 | 100 | 100 | 100 | 100 |
| Safety relief devices (see § 179.200-18) | 179.201-7 | Vent | Valve or vent | Valve or vent | Valve or vent | 179.201-7 | Valve or vent |
| Valve start-to-discharge pressure p.s.i. (±3 p.s.i.) | 35 | 35 | 35 | 75 | 75 | 75 | 75 |
| Valve vapor tight pressure (minimum p.s.i.) | 28 | 28 | 28 | 60 | 60 | 60 | 60 |
| Valve flow rating pressure (maximum p.s.i.) | 45 | 45 | 45 | 85 | 85 | 85 | 85 |
| Vent bursting pressure (maximum p.s.i.) | 45 | 45 | 45 | 75 | 75 | 75 | 75 |
| Gauging devices (see § 179.200-16) | Required | Required | Optional | Required | Required | Required | Required |
| Top loading and unloading devices (see § 179.200-16) | Required (valves optional) | Required (valves optional) | Required (valves optional) | Optional | Required (valves optional) | Required (valves optional) | Optional (if used, valves required) |
| Bottom outlet (see § 179.200-17(a)) | Prohibited | Prohibited | Prohibited | do | Prohibited | Prohibited | Optional |
| Bottom washout (see § 179.200-17(b)) | Optional | do | do | do | Optional | Optional | Do |
| Closure for manway (see § 179.200-15) | 179.201-6(b) | 179.201-6(b) | 179.201-6(c) | 179.201-6(a) | 179.201-6(a) | 179.201-6(a) | 179.201-6(a) |
| Stress relief (SR) or heat treatment (HT) (see § 179.200-11) | SR | SR | HT (179.201-5) | Prohibited | Prohibited | SR | SR |
| Other requirements | | 179.201-3 | | | | | |
| | 111A100W4 | 111A100W5 | 111A100W6 | 111A60F1 ¹ 111A100F1 ¹ 111A100F2 ¹ | 117A340W ² | 120A300W ² | |
| Material (see § 179.200-7) | Steel | Steel | Alloy steel | | | | |
| Insulation (see § 179.200-4) | Required (179.201-11) | Optional | Optional | | | | |
| Bursting pressure p.s.i. (see § 179.200-5) | 500 | 500 | 500 | | | | |
| Minimum plate thickness inches: | | | | | | | |
| Shell (see § 179.200-6) | 1/2 | 1/2 | 1/2 | | | | |
| Heads (see § 179.200-6 and § 179.200-8) | 1/2 | 1/2 | 1/2 | | | | |
| Dome | None | None | None | | | | |
| Minimum expansion capacity (see § 179.200-4) | 173.314(a) | 1 percent in tank | 2 percent in tank | | | | |
| Test pressure p.s.i. (see § 179.200-22) | 100 | 100 | 100 | | | | |
| Safety relief devices (see § 179.200-18) | Valve | Vent | Valve or vent | | | | |
| Valve start-to-discharge pressure p.s.i. (±3 p.s.i.) | 75 | 75 | 75 | | | | |
| Valve vapor tight pressure (minimum p.s.i.) | 60 | 60 | 60 | | | | |
| Valve flow rating pressure (maximum p.s.i.) | 85 | 85 | 85 | | | | |
| Vent bursting pressure (maximum p.s.i.) | 75 | 75 | 75 | | | | |
| Gauging devices (see § 179.200-16) | Required (179.201-9) | Required | Required | | | | |
| Top loading and unloading devices (see § 179.200-16) | Required (valves required) | Required (valves optional) | Optional (if used, valves required) | | | | |
| Bottom outlet (see § 179.200-17(a)) | Prohibited | Prohibited | Optional | | | | |
| Bottom washout (see § 179.200-17(b)) | do | do | do | | | | |
| Closure for manway (see § 179.200-15) | 179.201-6(a) | 179.201-6(b) | 179.201-6(a), (c) | | | | |
| Stress relief (SR) or heat treatment (HT) (see § 179.200-11) | SR | SR | HT (179.201-5) | | | | |
| Other requirements | 179.201-8, 179.201-10 | 179.201-3 | | | | | |

¹ Tanks converted to DOT-111A series from existing forge-welded spec. DOT-105A300, 400, or 500 tanks, by modification using conversion details complying with DOT-111A specification requirements, shall be stenciled by substituting the letter "F" for the letter "W" in the specification designation.

² See § 179.101-1(a).

§ 179.201-2 Minimum plate thickness.

(a) The minimum plate thickness after forming shall be as follows:

§ 179.201-3 Lined tanks.

(a) Each tank or each compartment thereof shall be lined with acid resisting rubber or other approved material vulcanized or bonded directly or otherwise attached to the metal tank, to provide a nonporous laminated lining, at least $\frac{5}{32}$ -inch thick, except overall rivets and seams formed by riveted attachments where the lining shall be double thickness. Rubber lining shall overlap at least $1\frac{1}{2}$ inches at all edges, which shall be straight and be beveled to an angle of approximately 45° , or butted edges of lining shall be sealed with a 3-inch minimum strip of lining having 45° beveled edges. An additional rubber reinforcing pad at least $4\frac{1}{2}$ feet square and at least $\frac{1}{2}$ -inch thick shall be applied by vulcanizing to the lining on bottom of tank directly under the manway opening. The edges of rubber pad shall be beveled to an angle of approximately 45° . An opening in this pad for sump is permitted. Other approved lining materials shall be at least $\frac{5}{32}$ -inch thick. No lining shall be under tension when applied except due to conformation over rivet heads. Interior of tank shall be free from scale, oxidation, moisture, and all foreign matter during the lining operations.

(b) Before a tank car tank not originally built under pertinent specifications is lined with rubber, or other approved material, a report certifying that the tank and its equipment have been brought into compliance with the tank requirements of DOT Specification 103-B, 103-B-W, or 111A100-W-5 must be furnished by car owner to the party who is to apply the lining. A copy of this report in approved form certifying that tank has been lined in compliance with all requirements of this specification, must be furnished by party lining tank to car owner. Reports of the latest lining application shall be retained by the car owner until the next relining has been accomplished and recorded.

(d) All surfaces of attachments or fittings and their closures, exposed to the lading shall be covered with at least $\frac{1}{8}$ -inch acid-resistant material. Attachments made of metal not affected by the lading need not be acid resistant material covered. Hard rubber or polyvinylchloride may be used for pressure retaining parts of safety vents provided the material is resistant to corrosive or solvent action of the lading in the liquid or gas phase and is suitable for the service temperature.

§ 179.201-4 Material.

(a) Except for protective housing, all fittings, tubes and castings and all projections and their closures shall also meet the requirements specified in AAR Specifications for Tank Cars, Appendix M, Section M3.03(b).

§ 179.201-5 Heat treatment.

(a) All welding of the tank shell and of attachments welded directly thereto shall be heat treated as a unit to remove stresses at the proper temperature to obtain corrosion resistance specified in AAR Specifications for Tank Cars, Appendix M, section M3.03(b), except for commodities not classed as Corrosive Liquids in Part 73 of this chapter, tanks made of ASTM A 240 Type 304L or 316L are not required to be heat treated as a unit to remove stresses, nor to obtain the corrosion resistance specified in AAR Specifications for Tank Cars, Appendix M, section M3.03(b).

§ 179.201-6 Closures for manways.

(c) Manway ring and cover shall be made of the metal specified in AAR Specifications for Tank Cars, Appendix M, section M3.03(b).

§ 179.201-7 Safety relief devices.

(a) Each tank or compartment shall be equipped with a safety vent unless characteristics of the lading require a safety relief valve. These devices shall comply with § 179.200-18.

(Q) By amending § 179.202 in its entirety.

§ 179.202 Special commodity requirements for non-pressure tank car tanks.

(a) In addition to §§ 179.200 and 179.201, the following requirements are applicable.

(1) *Flammable liquids not specifically provided for.* Refer to § 173.119 of this chapter.

(2) *Dimethyl dichlorosilane, ethyl dichlorosilane, ethyl trichlorosilane, methyl trichlorosilane, trimethyl chlorosilane, vinyl trichlorosilane, methyl dichlorosilane and trichlorosilane.* Refer to §§ 173.135 and 173.136 of this chapter.

(3) *Amyl mercaptan, butyl mercaptan, ethyl mercaptan, isopropyl mercaptan, propyl mercaptan, and aliphatic mercaptan mixtures.* Refer to § 173.141 of this chapter.

(4) *Potassium nitrate mixed (fused) with sodium nitrite.* Refer to § 173.183 of this chapter.

(5) *Phosphorus, white or yellow.* Refer to § 173.190 of this chapter.

(6) *Cumene hydroperoxide, diisopropylbenzene hydroperoxide and paramenethane hydroperoxide.* Refer to § 173.224 of this chapter.

(7) *Titanium tetrachloride, anhydrous.* Refer to § 173.247 of this chapter.

(8) *Chloroacetyl chloride.* Refer to § 173.253 of this chapter.

(9) *Hydrochloric (muriatic) acid not over 38 percent strength by weight except acid of 22° Baume strength or other fuming acids.* Refer to § 173.263 of this chapter.

(10) *Hydrogen peroxide solution in water exceeding 52 percent by weight.* Refer to § 173.266 of this chapter.

(11) *Phosphorus oxychloride, phosphorus trichloride, and thiophosphoryl*

chloride. Refer to § 173.271 of this chapter.

(12) *Sulfuric acid of concentrations 65.25 percent (approximately 1.559 specific gravity) (52° Baume) or greater.* Refer to § 173.272 of this chapter.

(13) *Sulfur trioxide, stabilized.* Refer to § 173.273 of this chapter.

(14) *Anhydrous hydrazine and hydrazine solutions containing 50 percent or less of water.* Refer to § 173.276 of this chapter.

(15) *Formic acid and formic acid solution.* Refer to § 173.289 of this chapter.

(16) *Monochloroacetic acid, liquid.* Refer to § 173.294 of this chapter.

(17) *Benzyl chloride.* Refer to § 173.295 of this chapter.

(18) *Ethylene oxide.* Refer to § 173.124 of this chapter.

(19) *Dimethylhydrazine, unsymmetrical.* Refer to § 173.145 of this chapter.

(20) *Hydrofluoric acid.* Refer to § 173.264(a) (8) of this chapter.

(21) *Nitric acid.* Refer to § 173.268 of this chapter.

(R) By amending Subpart D Heading to read as follows:

Subpart D—Specifications for Non-pressure Tank Car Tanks (Classes 103, 104, 111A, and 115A)

(S) By adding § 179.220 to read as follows:

§ 179.220 General specifications applicable to nonpressure tank car tanks consisting of an inner container supported within an outer shell (class 115A-W).

§ 179.220-1 Tanks built under these specifications shall meet the requirements of §§ 179.220 and 179.221.

§ 179.220-2 Approval.

(a) For procedure for securing approval, see § 179.3.

§ 179.220-3 Type.

(a) Tanks built under these specifications shall consist of an inner container, a support system for the inner container and an outer shell.

(b) The inner container shall be a fusion-welded tank of circular cross section with formed heads designed convex outward and shall have a manway on top of the tank as prescribed herein. When the inner container is divided into compartments, each compartment shall be considered as a separate container.

(c) The outer shell shall be a fusion-welded tank with heads designed convex outward.

§ 179.220-4 Insulation.

(a) The annular space between the inner container and the outer shell shall contain an approved insulation material.

§ 179.220-5 Bursting pressure.

(a) The minimum required bursting pressure of the inner container is listed in § 179.220-1.

§ 179.220-6 Thickness of plates.

(a) The wall thickness after forming of the inner container shell and 2:1 ellipsoidal heads shall be not less than

specified in § 179.221-1, nor that calculated by the following formula:

$$t = \frac{Pd}{2SE}$$

where:

- d = Inside diameter in inches;
- E = 0.9 welded joint efficiency; except $E = 1.0$ for seamless heads;
- P = Minimum required bursting pressure in p.s.i.;
- S = Minimum tensile strength of plate material in p.s.i. as prescribed in AAR Specifications for Tank Cars, Appendix M, Table M-1;
- t = Minimum thickness of plate in inches after forming.

(b) The wall thickness after forming of the inner container heads, flanged and dished, shall be not less than specified in Table M-1, nor that calculated by the following formula:

$$t = \frac{5PL}{6SE}$$

where:

- E = 0.9 welded joint efficiency; except $E = 1.0$ for seamless heads;
- L = Main inside radius to which head is dished, measured on concave side in inches;
- P = Minimum required bursting pressure in p.s.i.;
- S = Minimum tensile strength of plate material in p.s.i. as prescribed in AAR Specifications for Tank Cars, Appendix M, Table M-1;
- t = Minimum thickness of plate in inches after forming.

(c) The wall thickness after forming of the cylindrical section and heads of the outer shell shall be not less than seven-sixteenths inch.

(d) See § 179.220-9 for plate thickness requirements for inner container when divided into compartments.

§ 179.220-7 Material.

(a) The plate material used to fabricate the inner container and nozzles shall be as specified in AAR Specifications for Tank Cars, Appendix M, section M3.00.

(b) The plate material used to fabricate outer shell and nozzles shall be as specified in AAR Specifications for Tank Cars, Appendix M, section M3.01.

(c) All appurtenances on the inner container in contact with the lading shall be made of approved material compatible with the plate material of the inner container. These appurtenances shall not be subject to rapid deterioration by the lading, or shall be coated or lined with suitable corrosion resistant material.

§ 179.220-8 Tank heads.

(a) Tank heads of the inner container, inner container compartments and outer shell shall be of approved contour and may be dished or ellipsoidal for pressure on concave side.

(b) Dished heads shall have main inside radius not exceeding 10 feet and inside knuckle radius shall be not less than 3 3/4 inches for steel and alloy steel tanks nor less than 5 inches for aluminum alloy tanks.

(c) Ellipsoidal heads shall be an ellipsoid of revolution in which the

major axis shall equal the diameter of the shell and the minor axis shall be one-half the major axis.

§ 179.220-9 Compartment tanks.

(a) The inner container may be divided into compartments by inserting interior heads, or by fabricating each compartment as a separate container and joining with a cylinder, or by fabricating each compartment as a separate tank without a joining cylinder. Each compartment shall be capable of withstanding, without evidence of yielding or leakage, the required test pressure applied in each compartment separately or in any combination of compartments.

(b) When the inner container is divided into compartments by fabricating each compartment as a separate container and joining with a cylinder, the cylinder shall have a plate thickness not less than that required for the inner container shell and shall be applied to the outside surface of the straight flange portion of container head. The cylinder shall fit the straight flange tightly for a distance of at least two times the plate thickness or 1 inch, whichever is greater and shall be joined to the straight flange by a full fillet weld. Distance from fillet weld seam to container head seam shall be not less than 1 1/2 inches or three times the plate thickness, whichever is greater.

§ 179.220-10 Welding.

(a) All joints shall be fusion-welded in compliance with AAR Specifications for Tank Cars, Appendix W. Welding procedures, welders and fabricators shall be approved.

(b) Radiograph of the outer shell is not a specification requirement.

§ 179.220-11 Stress relieving.

(a) Stress relieving of the inner container is not a specification requirement.

(b) Stress relieving of the cylindrical portions of the outer shell to which the anchorage or draft sills are attached shall comply with AAR Specifications for Tank Cars, Appendix W.

§ 179.220-12 Tank mounting.

(a) See § 179.10.

§ 179.220-13 Inner container manway nozzle and cover.

(a) Inner container manway nozzle shall be of approved design with access opening at least 18 inches inside diameter, or at least 14 inches by 18 inches obround or oval.

(b) Manway covers shall be of approved type. Design shall provide a secure closure of the manway and shall make it impossible to remove cover while tank interior is under pressure.

(c) All joints between manway covers and their seats shall be made tight against leakage of vapor and liquid by use of suitable gaskets.

(d) Manway covers shall be cast forged or fabricated metal complying with § 179.220-7(c).

(e) A seal shall be provided between the inner container manway nozzle and the opening in the outer shell.

§ 179.220-14 Openings in the tanks.

(a) Openings in the inner container and outer shell shall be reinforced in compliance with AAR Specifications for Tank Cars, Appendix E. In determining the required reinforcement area for openings in the outer shell, t shall be one-fourth of an inch.

§ 179.220-15 Support system for inner container.

(a) The inner container shall be supported within the outer shell by a support system of adequate strength and ductility at its operating temperature to support the inner container when filled with liquid lading to any level. The support system shall be designed to support, without yielding, impact loads producing accelerations of the following magnitudes and directions when the inner container is fully loaded so that the car is at its rail load limit, and the car is equipped with a conventional AAR Specification M-901 draft gear:

| | |
|--------------|----|
| Longitudinal | 7G |
| Transverse | 3G |
| Vertical | 3G |

The longitudinal acceleration may be reduced to 3G where a cushioning device of approved design, which has been tested to demonstrate its ability to limit body forces to 400,000 pounds maximum at a 10 miles per hour impact, is used between the coupler and the tank structure. The support system shall be of approved design and such that the inner container is thermally isolated from the outer shell to the best practical extent.

§ 179.220-16 Expansion capacity.

(a) Expansion capacity shall be provided in the shell of the inner container as prescribed in § 179.221-1.

§ 179.220-17 Gauging devices, top loading and unloading devices, venting and air inlet devices.

(a) When installed, these devices shall be of approved design which will prevent interchange with any other fixture, and be tightly closed. Unloading pipes shall be securely anchored within the inner container. Each inner container or compartment thereof may be equipped with one separate air connection.

(b) When the characteristics of the commodity for which the car is authorized are such that these devices must be equipped with valves or fittings to permit the loading and unloading of the contents these devices including valves, shall be provided with a protective housing except when plug or ball-type valves with operating handles removed are used. Provision shall be made for closing pipe connections of valves.

(c) Inner container may be equipped with a vacuum relief valve of approved design.

(d) When gauging device is required in § 179.221-1, an outage scale visible through manway opening shall be provided. If loading devices are applied to permit tank loading with cover closed, a telltale pipe may be provided. Telltale pipe shall be capable of determining that

uled outage is provided. Pipe shall be equipped with 1/4-inch maximum NPT control valve mounted outside tank and enclosed within a housing. Other approved devices may be used in lieu of outage scale or telltale pipe.

(e) Bottom sump, if applied, shall be of cast, fabricated, or forged metal.

§ 179.220-18 Bottom outlets.

(a) Inner container may be equipped with bottom outlet of approved design and an opening provided in the outer shell for access thereto. If applied, bottom outlet shall comply with the following requirements:

(1) On newly built and empty cars with truck centers through 60 feet, 6 inches the extreme projection of the bottom outlet equipment shall be at least 12 inches above the top of rail on level track. On cars with truck centers greater than 60 feet, 6 inches the minimum rail clearance shall be in accordance with the graph in Appendix E of the AAR Specifications for Tank Cars. All bottom outlet reducers and closures and their attachments shall be secured to car by at least 3/8-inch chain or its equivalent, except that outlet closure plugs may be attached by 1/4-inch chain. When the bottom outlet closure is of the combination cap and valve type, the pipe connection to the valve shall be closed by a plug, cap, or approved quick-coupling device.

(2) Bottom outlet shall be provided with a liquid tight closure at its lower end.

(3) The valve and its operating mechanism shall be applied to the outside bottom of the inner container. Valve operating mechanism shall be provided with a suitable locking arrangement to insure positive closure during transit.

(4) Valve outlet nozzle and valve body shall be of cast, fabricated, or forged metal. If welded to inner container, they shall be of good weldable quality in conjunction with metal of tank.

(5) To provide for the attachment of unloading connections, the bottom of the main portion of the outlet nozzle or valve body, or some fixed attachment thereto, shall be provided with threaded cap closure arrangement or bolted flange closure arrangement having minimum 1-inch threaded pipe plug.

(6) If outlet nozzle and its closure extends below the bottom of outer shell, a breakage groove or its equivalent shall be applied. If a breakage groove is applied, a V shall be cut (not cast) in the upper part of outlet nozzle at a point immediately below lowest part of valve to a depth that will leave thickness of nozzle wall at the root of the V not over one-fourth inch. The outlet nozzle or the valve body may be steam jacketed, in which case the breakage groove or its equivalent shall be below the steam chamber.

(7) The valve body shall be of a thickness which will prevent distortion of the valve seat or valve by any change in contour of the shell resulting from expansion

of lading, or other causes, and which will insure that accidental breakage of the outlet nozzle will occur at or below the V groove, or its equivalent.

(8) The valve shall have no wings or stem projecting below the V groove or its equivalent. The valve and seat shall be readily accessible or removable for repairs, including grinding.

(b) Inner container may be equipped with bottom washout of approved design. If applied, bottom washout shall comply with the following requirements:

(1) On newly built and empty cars with truck centers through 60 feet, 6 inches the extreme projection of the bottom washout equipment shall be at least 12 inches above the top of rail on level track. On cars with truck centers greater than 60 feet, 6 inches the minimum rail clearance shall be in accordance with the graph in Appendix E of the AAR Specifications for Tank Cars.

(2) Bottom washout shall be of cast, forged or fabricated metals. If welded to inner container, it shall be of good weldable quality in conjunction with metal of tank.

(3) If washout nozzle extends below or the bottom of outer shell, a V groove shall be cut (not cast) in the upper part of the nozzle at a point immediately below the lowest part of inside closure seat or plug to a depth that will leave wall thickness of nozzle at the root of the V not over one-fourth inch. Where nozzle is not a single piece, provision shall be made for the equivalent of the breakage groove. The nozzle shall be of a thickness to insure that accidental breakage will occur at or below the V groove or its equivalent. On cars without continuous center sills, the breakage groove or its equivalent shall not be more than 15 inches below the tank shell.

(4) The closure plug and seat shall be readily accessible or removable for repairs.

(5) The closure of the washout nozzle must be equipped with a 3/4-inch solid plug. Plug must be attached by at least a 1/4-inch chain.

(6) Joints between closures and their seats may be gasketed with suitable material.

§ 179.220-19 Safety-relief devices.

(a) Each inner container or compartment thereof shall be equipped with safety-relief devices of approved design as prescribed in § 179.221-1.

(b) When used, safety relief valves shall be made of metal not subject to rapid deterioration by the lading and mounted on top of inner container. Total valve discharge capacity shall be sufficient to prevent building up of pressure in the inner container to more than 10 psi above start-to-discharge pressure. See AAR Specifications for Tank Cars, Appendix A, for formula for calculating discharge capacity. The start-to-discharge pressures and vapor tight pressures shall comply with § 179.221-1.

(c) Each inner container or compartment thereof used for the transportation of corrosive liquids, flammable solids, oxidizing materials, or poisonous liquids or solids, class B, need not be equipped with safety-relief valves but if not so equipped, shall have one safety vent at least 1 3/4 inches inside diameter and made of material not subject to rapid deterioration by the lading. Safety vent shall be mounted on top of inner container and be of an approved design which will prevent interchange with fixtures prescribed in § 179.220-17, and closed with a frangible disc of lead or other approved material. Vent bursting pressure shall comply with § 179.221-1. Tanks equipped with vents shall be stencilled "Not For Flammable Liquids."

§ 179.220-20 Reinforcements, when used, and appurtenances not otherwise specified.

(a) All attachments to inner container and outer shell shall be applied by approved means.

§ 179.220-21 Interior heater systems.

(a) For heater systems inside of inner container see § 179.12.

§ 179.220-22 Closure for openings.

(a) All plugs shall be solid, with NPT threads, and shall be of a length which will screw at least six threads inside the face of fitting or tank. Plugs, when inserted from the outside of the outer shell tank heads, shall have the letter "S" at least three-eighth inch in size stamped with steel stamp or cast on the outside surface to indicate the plug is solid.

§ 179.220-23 Test of tanks.

(a) Each inner container or compartment thereof shall be tested hydrostatically to the pressure specified in § 179.221-1. The temperature of the pressurizing medium shall not exceed 100° F. during the test. The container shall hold the prescribed pressure for at least 10 minutes without leakage or evidence of distress. Safety-relief devices shall not be in place when test is made.

(b) Inner container shall be pressure tested before installation within outer shell. Items which, because of assembly sequence, must be welded to inner container after its installation within outer shell shall have their attachment welds thoroughly inspected by a nondestructive dye penetrant method or its equivalent.

(c) Pressure testing of outer shell is not a specification requirement.

§ 179.220-24 Tests of safety-relief valves.

(a) Each safety-relief valve shall be tested by air or gas for compliance with § 179.221-1 before being put into service.

§ 179.220-25 Stamping.

(a) To certify that the tank complies with all specification requirements each outer shell shall be plainly and permanently stamped in letters and figures at least three-eighths inch high into the

metal near the center of both outside heads as follows:

| Example of required stamping | |
|-----------------------------------------------------------------------|------------------|
| Specification ----- | DOT-115A60W6. |
| Inner container: | Inner container: |
| Material ----- | ASTM A 240-316L. |
| Shell thickness----- | 0.167 inch. |
| Head thickness----- | 0.150 inch. |
| Tank builders initials. | ABC. |
| Date of original test. | 00-000. |
| Outer shell: | Outer shell: |
| Material ----- | ASTM A 285-C. |
| Tank builders initials. | WYZ. |
| Car assembler (if other than inner container or outer shell builder). | DEF. |

§ 179.220-26 Stenciling.

(a) The outer shell, or the jacket if outer shell is insulated shall be stenciled in compliance with AAR Specifications for Tank Cars, Appendix C.

(b) Stenciling shall be applied on both sides of the outer shell or jacket near the center in letters and figures at least 1½ inches high to indicate the safe upper temperature limit, and lower limit, if applicable, for inner tank, insulation and support system.

§ 179.220-27 Certificate of construction.

(a) See § 179.5.

(T) By adding § 179.221 to read as follows:

§ 179.221 Individual specification requirements applicable to tank car tanks consisting of an inner container supported within an outer shell.

§ 179.221-1 Individual specification requirements.

(a) In addition to § 179.220, the individual specification requirements for the inner container are as follows:

| Specifications | 115A60W1 | 115A60ALW | 115A60W6 |
|----------------------------------------------------------------------|--------------------|--------------------|--------------------|
| Inner container material (see 179.220-7)..... | Steel..... | Al alloy..... | Alloy steel. |
| Bursting pressure, p.s.i. (see 179.220-5)..... | 240..... | 240..... | 240. |
| Minimum plate thickness, shell and heads inches (see 179.220-6)..... | ¼..... | ¾..... | ¾. |
| Minimum expansion capacity (see 179.220-16)..... | 2 percent in tank. | 2 percent in tank. | 2 percent in tank. |
| Test pressure, p.s.i. (see 179.220-23)..... | 60..... | 60..... | 60. |
| Safety-relief devices (see 179.220-19)..... | Valve or vent..... | Valve or vent..... | Valve or vent. |
| Valves start-to-discharge pressure, p.s.i. (±3 p.s.i.)..... | 35..... | 35..... | 35. |
| Valve vapor tight pressure (minimum, p.s.i.)..... | 28..... | 28..... | 28. |
| Valve flow rating pressure (maximum, p.s.i.)..... | 45..... | 45..... | 45. |
| Vent rupture pressure (maximum, p.s.i.)..... | 45..... | 45..... | 45. |
| Gauging devices (see 179.220-17)..... | Required..... | Required..... | Required. |
| Top loading and unloading devices (see 179.220-17)..... | Optional..... | Optional..... | Optional. |

(U) By amending paragraphs (a), (b), and (c) in § 179.300-6; amending the Heading and paragraphs (a) and (b) in § 179.300-7; amending paragraphs (a) and (b) in § 179.300-8; amending paragraph (b) in § 179.300-17 as follows:

§ 179.300-6 Thickness of plates.

(a) For class DOT-110A tanks, the wall thickness after forming of the cylindrical portion of the tank shall not be less than that specified in § 179.301 nor that calculated by the following formula:

$$t = \frac{Pd}{2SE}$$

where:

d = Inside diameter in inches;
 E = 1.0 welded joint efficiency;
 P = Minimum required bursting pressure in p.s.i.;
 S = Minimum tensile strength of plate material in p.s.i. as prescribed in AAR Specifications for Tank Cars, Appendix M, Table M-1;
 t = Minimum thickness of plate in inches after forming.

(b) For class DOT-106A tanks, the wall thickness after forming of the cy-

lindrical portion of the tank shall not be less than that specified in § 179.301 and shall be such that at the tank test pressure the maximum fiber stress in the wall of the tank will not exceed 15,750 p.s.i. as calculated by the following formula:

$$s = \frac{p(1.8D^2 + 0.4d^2)}{D^2 - d^2}$$

where:

d = Inside diameter in inches;
 D = Outside diameter in inches;
 p = Tank test pressure in p.s.i.;
 s = Wall stress in p.s.i.

(c) If plates are clad with material having tensile strength at least equal to the base plate, the cladding may be considered a part of the base plate when determining the thickness. If cladding material does not have tensile strength at least equal to the base plate, the base plate alone after forming shall meet the thickness requirements.

§ 179.300-7 Materials.

(a) Carbon steel plate used to fabricate tanks having heads fusion welded to tank shell, shall comply with ASTM Specifications A285, A212, A515, Grade

65 and Grade 70 as specified in AAR Specifications for Tank Cars, Appendix M, section M3.01.

(b) Carbon steel plate material used to fabricate tanks with forge-welded heads shall be open hearth boiler plate of firebox quality with specification ASTM A285-66, Grade A as specified in AAR Specifications for Tank Cars, Appendix M, section M3.01.

§ 179.300-8 Tank heads.

(a) Class DOT-110A tanks shall have fusion-welded heads formed concave to pressure. Heads for fusion welding shall be an ellipsoid of revolution 2:1 ratio of major to minor axis. They shall be one piece, hot formed in one heat so as to provide a straight flange at least 1½ inches long. The wall thickness after forming shall not be less than that calculated by the following formula:

$$t = \frac{Pd}{2SE}$$

where:

d = Inside diameter in inches;
 E = 1.0 welded joint efficiency;
 P = Minimum required bursting pressure in p.s.i.;
 S = Minimum tensile strength of plate material in p.s.i. as prescribed in AAR Specifications for Tank Cars, Appendix M, Table M-1;
 t = Minimum thickness of plate in inches after forming.

(b) Class DOT-106A tanks shall have heads formed convex to pressure. Heads for forge welding shall be torispherical with an inside radius not greater than the inside diameter of the shell. They shall be one piece, hot formed in one heat so as to provide a straight flange at least 4 inches long. They shall have snug drive fit into the shell for forge welding. The wall thickness after forming shall be sufficient to meet the test requirements of § 179.300-16 and to provide for adequate threading of openings.

§ 179.300-17 Tests of safety relief devices.

(b) Frangible discs of safety vents shall be tested as prescribed in AAR Specifications for Tank Cars, Appendix A.

(v) By amending paragraph (a) Table in § 179.301 to read as follows:

§ 179.301 Individual specification requirements for multiunit tank car tanks.

(a) * * *

| DOT specifications | 106A100X | 106A800X | 110A500W | 110A800W | 110A1000W |
|-------------------------------------------------|-----------------|-----------------|----------|----------|-----------|
| Bursting pressure p.s.i. (see § 179.300-5) | None specified. | None specified. | 1250 | 2000 | 2500 |
| Minimum thickness shell, inches | 1 3/32 | 1 1/8 | 1 1/2 | 1 5/8 | 1 9/16 |
| Test pressure, p.s.i. (see § 179.300-16) | 500 | 800 | 500 | 800 | 1000 |
| Safety-relief devices p.s.i. (see § 179.300-15) | | | | | |
| Start-to-discharge, or burst maximum | 375 | 600 | 375 | 600 | 750 |
| Vapor-tight, minimum | 300 | 480 | 300 | 480 | 600 |

(W) By amending paragraph (a) table in § 179.302 to read as follows:

§ 179.302 Special commodity requirements for multiunit tank car tanks.

| Commodity | Safety-relief device | Valve protective housing | Miscellaneous |
|------------------------------------------|-------------------------|--------------------------|------------------|
| Chlorine trifluoride | Prohibited ¹ | | |
| Chloropierin | do. ¹ | Gas tight ² | |
| Hydrofluoric acid | do. ¹ | do. ² | |
| Hydrogen sulfide | do. ¹ | (³) | |
| Methyl mercaptan | do. ¹ | | |
| Nitrogen dioxide liquid | do. ¹ | Gas tight ² | |
| Do | do. ¹ | do. ² | |
| Nitrogen tetroxide liquid | do. ¹ | do. ² | |
| Nitrogen tetroxide nitric oxide mixtures | do. ¹ | do. ² | |
| Nitrosyl chloride | Fusible plugs required. | | (⁴) |
| Pyroforic liquids, n.o.s. | Valve required. | | |
| Phosgene | Prohibited ¹ | Gas tight ² | |
| Vinyl chloride | | | (⁵) |
| Vinyl methyl ether | | | (⁶) |
| Titanium tetrachloride (anhydrous) | Prohibited ¹ | | |

¹ When safety-relief devices are prohibited, containers may be equipped with solid steel plugs in the safety device openings.

² The detachable protective housing for the loading and unloading valves must withstand tank test pressure without leakage and shall be approved by the Bureau of Explosives.

³ All parts of valves and safety-relief devices in contact with the lading shall be of a metal or other material, suitably treated if necessary, which will not cause formation of any acetylides.

⁴ Tanks for nitrosyl chloride shall be nickel clad.

⁵ Valve outlets must have gastight caps or plugs applied.

(X) By amending Subpart F Heading to read as follows:

Subpart F—Specifications for Liquefied Hydrogen Only or Liquefied Ethylene Only Tank Car Tanks (Class 113A)

(Y) By amending § 179.400 in its entirety.

§ 179.400 General specifications applicable to liquefied hydrogen and liquefied ethylene tank car tanks.

§ 179.400-1 General.

(a) Tanks built under these specifications shall meet the requirements of §§ 179.400 and 179.401.

§ 179.400-2 Approval.

(a) For procedure for securing approval, see § 179.3.

§ 179.400-3 Type.

(a) Tanks built under these specifications shall consist of an inner container suitably supported within an outer shell and forming a part of the railway tank car. The permissible out of roundness of

the cylindrical portion of the inner and outer shell shall be no greater than that permitted in section VIII of the ASME Boiler and Pressure Vessel Code (1965 Edition) paragraph UG-80. The annular space shall contain a suitable insulation. Tanks shall be circular in cross section, with heads designed convex outward. The tank car shall be equipped with piping systems for vapor venting and transfer of lading and with safety relief devices, controls, gauges, and valves prescribed herein for safe operation of the unit in storage, transport and transfer of lading.

§ 179.400-4 Insulation.

(a) The insulation systems shall be such that the total heat transfer from the atmosphere at 90° F. to the lading at the log mean temperature between the maximum temperature at the time of shipment and the lading temperature at the safety valve start-to-discharge pressure does not exceed the value given in § 179.401-1(a). The insulation requirements are based upon a 30-day holding time. The total heat transfer shall include the heat transferred through the insulation, support system and the piping.

(1) The formula used to compute the maximum heat transfer is:

$$q = \frac{(h_2 - h_1) (F.D.) - (v dp/778)}{H.T.}$$

where:

q=heat transfer in B.t.u./day/lb. of water capacity;

h₂=Enthalpy of liquid at safety valve setting, B.t.u./lb.;

h₁=Enthalpy of liquid at maximum shipping pressure B.t.u./lb.; 10 p.s.i.g. for DOT-113C60W, 113C-1220W, and 113D60W; 25 p.s.i.g. for 113D120W;

F.D.=Filling density=density of liquid at safety valve setting, lbs./gal. divided by 8.32828;

v=Volume of one pound of water, cu.ft./lb.;

dp=Pressure change from shipping to safety valve setting, p.s.i.;

H.T.=Holding time=30 days.

(b) If the inner vessel is divided into compartments, the total heat transfer shall be calculated for each compartment with adjoining compartments empty and at a temperature of 90° F.

§ 179.400-5 Bursting and buckling pressure.

(a) The inner container minimum required bursting pressure is listed in § 179.401-1(a).

(b) If the insulation system is an evacuated type, the outer container shall be designed to withstand an external pressure of one atmosphere in addition to the loads specified in AAR Specifications for Tank Cars, section AAR.23 and the

loads transferred to the outer container through the support system.

§ 179.400-6 Thickness of plates.

(a) The wall thickness after forming of the inner container shell and heads shall not be less than that specified in § 179.401, nor that calculated by the following formula:

$$t = \frac{Pd}{2SE}$$

where:

d=Inside diameter in inches;

E=0.9 welded joint efficiency; except E=1.0 for seamless heads;

P=Minimum required bursting pressure in p.s.i.g.;

S=Minimum ultimate tensile strength of plate material in p.s.i. as prescribed in § 179.400-7;

t=Minimum thickness of plate in inches after forming.

(a) Alloy steel plate used to fabricate the inner container shell, heads and appurtenances shall comply with ASTM Specification A240 type 304 as specified in AAR Specifications for Tank Cars, Appendix M, section M3.03. The plate material used in tank and attachments shall be suitable for use at minus 423° F. and shall be in the annealed condition prior to fabricating, forming, and fusion welding.

(b) Nine percent nickel alloy steel plate used to fabricate the inner container shell, heads and appurtenances shall comply with ASME Code Case 1308 as specified in AAR Specifications for Tank Cars, Appendix M, section M3.05. The plate material used in tank and attachments shall be suitable for use at minus 175° F., and shall be double normalized and tempered prior to fabricating, forming and fusion welding.

(c) Carbon steel plate used to fabricate outer shell shall be as specified in AAR Specifications for Tank Cars, Appendix M, section M3.01.

§ 179.400-8 Heads of inner container.

(a) Tank heads of the inner container and inner container compartment shall preferably be ellipsoids of revolution in which the major axis shall equal the inside diameter of the shell and the minor axis shall be one-half of the major axis. Formed heads of other approved contours may be used.

§ 179.400-9 Welding inner container.

(a) All joints shall be fusion-welded in compliance with the requirements of the AAR Specifications for Tank Cars, Appendix W, except that the following requirements supersede requirements listed under "Test plates," "Bend test," and "Impact test" of Appendix W.

(b) Test plates: A welded test plate of the dimensions shown in Figure W2 of AAR Specifications for Tank Cars, Appendix W, shall be made for each container using the same weld procedure as used in welding the longitudinal seams of the container. Test plates shall be prepared from material having the same material specification and mill heat numbers as used in the shell or main heads of the inner container.

After welding is completed, the test plate shall be radiographed, and the standards of judgment of weld acceptability as set forth in section W19.00 of AAR Specifications for Tank Cars, Appendix W, shall be followed.

(c) Test specimens: The following test specimens shall be removed from the welded test plate and subjected to tests prescribed below:

(1) *Bend test.* Four transverse bend test specimens shall be removed from the welded test plate transverse to the welded joint of the test plate. The specimens shall be of rectangular cross section 1½ inches wide and the full thickness of the test plate. Weld reinforcements on each side of each test specimen shall be removed flush with the plane of the plate surface. Specimens shall be saw-cut from the test plate. Removal of test specimens from the test plate by means of flame cutting is prohibited. The specimens shall be subjected to a guided bend test, and two transverse face bend tests and two transverse root bend tests shall be performed. A bend test specimen that reveals no cracks or other open defects exceeding one-eighth inch measured in any direction on the convex surface of the specimen shall be considered to have passed the bend test. Cracks occurring on the corners of the specimen during the test shall not be considered as cause for re-

jection, unless there is definite evidence that they are the result of slag inclusions in the weld or other internal defects.

(2) *Impact tests.* Three sets of three impact test specimens shall be saw-cut from the welded test plate. These specimens shall be used for determining the impact properties of the plate material, weld zone and heat-affected zone. Impact test specimens shall be of the Charpy type, keyhole or milled U-notch for the testing of ASTM Specification A-240-63, Type 304 and, milled V-notch for the testing of ASME Code Case 1308-5. The base of the notch shall be normal to the plate surface, and shall conform in all respects to Figure 3 of ASTM Specification E-23-64. Impact test specimens shall be cooled in liquid nitrogen (-320° F.). The apparatus for testing the specimens shall be in accordance with the requirements of ASTM Specification E-23-64. The test piece and handling tongs shall be cooled for a length of time sufficient to reach the temperature of liquid nitrogen. The specimen shall be quickly transferred from the cooling device to the anvil of the testing machine and broken within a time lapse of not more than 6 seconds.

(3) *Impact properties.* The impact properties of each set of impact specimens shall be not less than the values listed below:

| Size of specimen | ASTM Spec. A-240-63 Type 304 (keyhole or milled U-notch) | | ASME Code Case 1308-5 (milled V-notch) | |
|-----------------------------|----------------------------------------------------------------------|------------------------------------------------------------------------------|----------------------------------------------------------------------|------------------------------------------------------------------------------|
| | Minimum impact value required for average of each set of 3 specimens | Minimum impact value permitted on 1 specimen only of each set of 3 specimens | Minimum impact value required for average of each set of 3 specimens | Minimum impact value permitted on 1 specimen only of each set of 3 specimens |
| | Feet-Pound | Feet-Pound | Feet-Pound | Feet-Pound |
| 55 mm x 10 mm x 10 mm..... | 15 | 10 | 25 | 20 |
| 55 mm x 10 mm x 7.5 mm..... | 12.5 | 8.5 | 21 | 17 |
| 55 mm x 10 mm x 5 mm..... | 10 | 7 | 17 | 14 |
| 55 mm x 10 mm x 2.5 mm..... | 5 | 3.5 | 8 | 6 |

When the average value of the three specimens equals or exceeds the minimum value permitted for a single specimen, and the value for more than one specimen is less than the minimum value required for the average of the three specimens, or when the impact value of one specimen is below the minimum value permitted for a single specimen, a retest of three additional specimens shall be made. The value from each retest specimen shall equal or exceed the minimum value required for the average of three specimens given above. When an erratic result is caused by a defective specimen or there is uncertainty in the test procedure, a retest is authorized.

§ 179.400-10 Stress relieving of inner container.

(a) Stress relieving of the inner container is not a requirement of this specification.

§ 179.400-11 Cleaning interior container.

(a) The interior of the tank and all lines connecting to it shall be thoroughly cleaned suitable for intended lading. Proper precautions shall be taken to

avoid subsequent recontamination of the system after cleaning.

§ 179.400-12 Test of inner container.

(a) After all items to be welded to the inner container have been welded in place, the inner container shall be pressure tested to the test pressure prescribed in § 179.401. The temperature of the pressurizing medium shall not exceed 100° F. during the test. The container shall hold the prescribed pressure for a period of not less than 10 minutes without leakage or evidence of distress. Due regard should be taken of the potential hazard involved in a pneumatic test. After the container has passed the pressure test, the container and piping shall be emptied of all water and purged of all water vapor if water is used for testing.

(b) Caulking of welded joints to stop leaks developed during the foregoing test is prohibited. Repairs to welded joints shall be made as prescribed in § 179.400-9.

§ 179.400-13 Radiography.

(a) All longitudinal and circumferential double-butt, fusion-welded joints of the inner container and outer shell shall be examined throughout their entire

length by the X-ray or gamma-ray method of radiography. The standards of judgment for acceptability of welds examined by radiography shall be in accordance with section W19.00 of AAR Specifications for Tank Cars, Appendix W.

§ 179.400-14 Support system for inner container.

(a) The inner container shall be supported within the outer shell by a support system of adequate strength and ductility at its operating temperature to support the inner container when filled with liquid lading to any level incidental to operation of the complete unit as a railway tank car. The support system shall be designed to be capable of supporting, without yielding, impact loads producing acceleration of the following magnitudes and directions when the inner container is fully loaded, and the car is equipped with a conventional AAR Specification M-901 draft gear:

| | |
|--------------------|----|
| Longitudinal | 7G |
| Transverse | 3G |
| Vertical | 3G |

The longitudinal acceleration may be reduced to 3G where a cushioning device of approved design, which has been tested to demonstrate its ability to limit body forces to 400,000 pounds maximum at 10 miles per hour, is used between the coupler and the tank structure. The support system shall be of an approved design and such that the inner container shall be thermally isolated from the outer shell to the best practical extent.

§ 179.400-15 Access to inner container.

(a) The inner container shall be provided with a means of access having a minimum inside diameter of 16 inches and having a welded closure so designed as to allow it to be reopened by grinding or chipping and to be closed again by rewelding without a need for new parts. A cutting torch shall not be used. The closure and the reinforcement of the opening in the container shall be of approved design and made of the same material as is used in the container. Consideration must be given in the design to minimizing contamination of the container and the vacuum space when the closure is opened and closed. The outer shell shall be provided with an access opening of sufficient size (and aligned with the container access opening) to permit removal of the container closure and access into the container. The closure and the reinforcement of the opening in the outer shell shall be of approved design and made of the same material as is used in the outer shell. The closure shall preferably be so designed as to allow it to be reopened by grinding or chipping and to be closed again by rewelding without a need for new parts. A passageway connecting the inner container with the outer shell is not a specification requirement.

§ 179.400-16 Outer shell.

(a) *Design.* The outer shell shall be designed to withstand an external pressure of 1 atmosphere.

(b) *Thickness of plates.* The wall thickness after forming of steel plates in the cylindrical portion of the outer shell shall be not less than seven-sixteenth inch.

(c) *Material.* Carbon steel plate used to fabricate outer tank shell shall be as specified in AAR Specifications for Tank Cars, Appendix M, section M3.01.

(1) All steel castings, steel forging and steel structural shapes shall be of material to an approved specification.

(2) Rivets, when used, shall be of steel to an approved specification.

(d) *Heads.* The formed heads at each end of the outer shell preferably shall be an ellipsoid of revolution in which the major axis shall equal the inside diameter of the shell and the minor axis shall be one-half of the major axis. Formed heads of other approved contours may be used, but in no case shall the wall thickness after forming be less than seven-sixteenth inch.

(e) *Stiffening rings.* If stiffening rings are used in designing the cylindrical portion of the outer shell for external pressure, they shall be attached to the shell by means of fillet welds on each side of the ring. Outside stiffening ring attachment welds shall be continuous. Inside ring attachment welds may be intermittent. When intermittent welds are used, the total length of welds on each side of the ring shall not be less than one-third of the circumference of the outer shell. Where a closed section is used, it shall be continuously welded on the outside of each leg. A portion of the outer shell may be included when calculating the moment of inertia of the ring. The effective width of shell plate, W , on each side of the attachment of the stiffening ring is given by:

$$W = \frac{0.78}{Rt}$$

where:

W = Width of shell effective on each side of the stiffening ring—*inches*;

R = outside radius of the outer shell—*inches*;

t = plate thickness of the outer shell—*inches*.

Where a stiffening ring is used which consists of a closed section having two webs attached to the outer shell, the shell plate between the webs shall be included up to the limit of twice the value of W defined above. The outer "flange" of the section shall be subject to the same limitation with W based on the R and t of the flange. Where two separate members, such as two angles, are located less than $2W$ apart they may be treated as a single stiffening ring member. (The maximum length of shell plate which may be considered effective is $4W$.)

(1) The cylindrical portion of the outer shell between stiffening rings shall be stiff enough to withstand an external pressure of 37.5 p.s.i.g. (critical collapsing pressure) as determined by the following formula:

$$P_c = \frac{2.6E(t/D)^{2.5}}{L/D - 0.45(t/D)^{0.5}}$$

where:

P_c = Critical collapsing pressure (37.5 p.s.i.g., minimum);

E = Modulus of elasticity of shell material—*lb./sq. in.*;

t = Minimum thickness of shell material—*inches*;

D = Outside diameter of shell—*inches*;

L = One-half of the distance from the centerline of the stiffening ring to the next line of support on one side, plus one-half of the centerline distance to the next line of support, if any, on the other side of the stiffening ring, both measured parallel to the axis of the vessel—*inches*. (A line of support is: (1) A stiffening ring which meets the requirements of this paragraph, or (2) a circumferential line on a head at one-third the depth of the head from the head tangent line.)

(2) The stiffening ring shall have a moment of inertia large enough to support an external pressure of 37.5 p.s.i.g. as determined by either of the following formulae:

$$I = \frac{0.035D^3LP_c}{E}$$

$$I' = \frac{0.046D^3LP_c}{E}$$

I = Required moment of inertia of stiffening ring about centroidal axis parallel to vessel axis—*inches⁴*;

I' = Required moment of inertia of combined section of stiffening ring and effective width of shell plate, about centroidal axis parallel to vessel axis—*inches⁴*;

P_c = Critical collapsing pressure (37.5 p.s.i.g., minimum);

E = Modulus of elasticity of shell material—*lb./sq. in.*;

t = Minimum thickness of shell material—*inches*;

D = Outside diameter of shell—*inches*;

L = One-half of the distance from the centerline of the stiffening ring to the next line of support on one side, plus one-half of the centerline distance to the next line of support, if any, on the other side of the stiffening ring, both measured parallel to the axis of the vessel—*inches*. (A line of support is: (1) A stiffening ring which meets the requirements of this paragraph, or (2) a circumferential line on a head at one-third the depth of the head from the head tangent line.)

(3) The permissible out-of-roundness of the cylindrical portion of the outer shell shall be no greater than that permitted in section VIII for out-of-roundness for external pressure of the ASME Boiler and Pressure Vessel Code.

(4) Where loads are applied to the outer shell or to the stiffening rings from the support system used to support the inner container within the outer shell, additional stiffening rings or an increased moment of inertia of stiffening rings designed for the external pressure will have to be provided to carry the support loads.

(f) *Welding.* All joints shall be fusion-welded in compliance with the requirements of AAR Specifications for Tank Cars, Appendix W. Welding procedures, welders and fabricators shall be ap-

proved. No more than two circumferential closing joints in the cylindrical portion of the outer shell, including head to shell joints, shall be single-welded butt joints using a backing strip on the inside of the joint. If the interior of the outer shell is divided into compartments, the compartment heads shall be attached inside the shell by fillet welding.

(g) *Stress relieving.* The cylindrical portion of the outer shell with the exception of the circumferential closing seams shall be stress relieved in accordance with the requirements of section W15.02 of the AAR Specifications for Tank Cars, Appendix W. All items welded to the shell shall be attached before stress relieving. Welds securing the inner container support system to the outer shell which cannot be made before final assembly and the tank heads at each end of the shell need not be stress relieved.

(h) *Tests of outer shell.* Pressure testing of outer shell is not a specification requirement.

§ 179.400-17 Insulation.

(a) The annular space between the inner container and outer shell shall contain an approved insulating system so installed as to insure against excessive settling and the creation of voids in the insulation when the car is in service. The material shall not burn or spark when touched with a glowing platinum wire in an atmosphere of air or lading.

(b) For hydrogen tank car tanks, the insulation shall be such that the total heat transfer from the atmosphere at ambient temperature to the hydrogen atmospheric pressure will not vaporize more than 5.2 pounds of liquefied hydrogen per hour (1,000 standard cubic feet per hour) when the car is stationary.

(c) For ethylene tank car tanks, the insulation shall be such that the total heat transfer from the atmosphere at 90° F. to the ethylene will not cause a rise in pressure to the safety relief valve start-to-discharge pressure as prescribed in § 179.401, for a minimum of 40 days after the car is offered for transport. The temperature of the liquefied ethylene when the car is offered in transportation shall not be warmer than minus 124° F. and the pressure shall not exceed 20 p.s.i.

(d) *Annular space:* The distance between the outside wall of the inner container and the inside wall of the outside shell shall not be less than 2 inches.

§ 179.400-18 Piping, vacuum line, vapor phase line, loading and unloading lines.

(a) *Vacuum lines.* The outer shell shall be provided with fittings to permit effective evacuation of the annular space between the outer shell and inner container.

(b) *Product lines.* The piping systems for vapor and liquid phase transfer and venting shall be made from materials compatible with the product and having satisfactory properties at lading temperature as listed in § 179.401. All valves gauges, and closures shall be mounted within suitable protective housings. The outlets of all vapor phase and liquid

phase lines shall be so located that accidental discharge from these lines will not impinge on any metal of the outer shell, car structure, trucks or safety appliances.

(c) *Vapor phase line.* Vapor phase line of sufficient size to permit safety devices covered in § 179.400-19(c) (1) and (2) connected to this line to operate at their designed capacity without excessive pressure buildup in the tank shall connect to the inner container. The vapor phase line shall have a manually operated shutoff valve located as close as possible to the outer shell and shall have a closure that is liquid and gas tight. The same line may be used for vapor phase blow down if the safety relief valve is provided with a lever for manual operation.

(d) *Vapor phase blow-down line.* A blow-down line shall be provided and it may be attached to the vapor phase line specified in § 179.400-18(c) and ahead of the shutoff valve in that line. It shall have a manually operated shutoff valve located as close as possible to the outer shell. The outlet from this line shall be outside its housing and positioned so that the discharge will be directed upward and away from operating personnel.

(e) *Pressure building system.* Not a specification requirement. If a pressure building system is provided for the purpose of pressurizing the vapor space of the inner container to facilitate unloading the liquid lading, the system shall be of approved design.

(f) *Loading and unloading line.* A liquid phase transfer line shall be provided and shall have a manually operated shutoff valve located as close as possible to the outer shell. A vapor trap shall be incorporated in the line and shall be located as close as possible to the inner shell.

(1) This line and valve on liquefied hydrogen cars shall be vacuum jacketed.

(2) This line and valve on liquefied ethylene cars shall be insulated.

§ 179.400-19 Safety relief devices.

(a) The tank shall be provided with safety relief devices for the protection of the tank assembly and piping systems. The discharge from these devices shall be directed away from operating personnel, principal load bearing members of the outer shell, car structure, trucks and safety appliances. Vent or weep holes in safety relief devices are prohibited. All main safety relief devices shall discharge to the outside of protective housing in which they are mounted. This provision does not apply to small safety relief valves installed to protect isolated short sections of lines between the final valve and end closure.

(b) *Materials.* Materials used in safety relief devices shall be suitable for use at the temperature of the lading as listed in § 179.401 and otherwise compatible with the lading in the liquid or vapor phase.

(c) *Inner container.* Safety relief devices for the inner container shall be attached to piping connected to the vapor phase of the inner container and

mounted so as to remain at ambient temperature prior to operation. Additional requirements are as follows:

(1) *Safety vent.* The inner container shall be equipped with a safety vent without an intervening shutoff valve and designed to function at a pressure less than the test pressure of the inner container. The safety vent capacity shall be sufficient to limit the pressure within the inner container to not over the test pressure during all conditions of operation, both normal and abnormal, including fire with loss of vacuum, when the insulation space is filled with air or gaseous lading at atmospheric pressure. The discharge shall be directed upward.

(2) *Safety relief valve.* The inner container shall be equipped with a safety relief valve without an intervening shutoff valve and set to start to discharge at a pressure not greater than 75 percent of the test pressure prescribed in § 179.401, less 15 p.s.i. Safety relief valve capacity shall be sufficient to limit the pressure within the inner container to 85 percent of the test pressure, less 15 p.s.i., even air when the insulation space is filled with or gaseous lading at atmospheric pressure (no vacuum) and the outer shell is at 130° F. The minimum size relief valve body shall be 3/4-inch IPS. The discharge shall be directed upward. See AAR Specifications for Tank Cars, Appendix A, for formula for calculating discharge capacity.

(3) *Evaporation control.* The routine release of vaporized lading shall be prevented or controlled as follows:

(i) For liquefied hydrogen service, the inner container shall be equipped with an approved device to prevent the discharge of a mixture exceeding 50 percent of the lower flammable limit to the atmosphere under normal conditions of storage and transport of lading. This device shall be set to start at a pressure not greater than 17 p.s.i. and shall have sufficient capacity to limit the pressure within the inner container to 17 p.s.i. when the discharge is equal to twice the normal venting rate during transportation with normal vacuum and the outer shell at 130° F.

(ii) For liquefied ethylene service, the insulation shall be adequate to prevent the lading pressure from increasing to the start-to-discharge pressure of the safety relief valve in less than 40 days. The shipper shall notify the Bureau of Explosives and the Bureau of Railroad Safety, Federal Railroad Administration, whenever a car is not received by the consignee within 20 days from the date of shipment.

(4) *Safety interlock.* Not a specification requirement. If a safety interlock is provided for the purpose of allowing transfer of the lading at a pressure higher than the pressure control device setting but less than the safety relief valve setting, the design shall be such that the safety interlock shall not affect the discharge path of the safety relief valve or safety vent at any time. The safety interlock shall automatically provide an unrestricted discharge path for

the pressure control device at all times when the tank car is in transport service.

(d) *Outer shell.* The outer shell shall be provided with a suitable relief device to prevent buildup of internal pressure in excess of 16 p.s.i. The discharge capacity of the relieving device shall be sufficient to vent pressure accumulating within the annular space. Safety vent, if used, shall be designed to prevent distortion of the frangible disc when the annular space is evacuated.

(e) *Piping system.* Additional safety relief valves shall be installed in each piping circuit where the system can be isolated by closing the shutoff valves so that a dangerous pressure can be built up. These safety relief valves shall be designed to open at a pressure sufficiently low to prevent damage to the component or system affected.

§ 179.400-20 Tests of safety relief valves.

(a) *Control valves.* (1) Manually or gas for compliance with § 179.401 before being put into service.

§ 179.400-21 Control valves and gauges.

(a) *Control valves.* (1) Manually operated shutoff valves and control valves shall be provided wherever needed for control of the vapor phase pressure, vapor phase venting, liquid transfer, and liquid flow rates.

(2) Control valves and shutoff valves shall be designed and constructed to provide positive shutoff, and to provide minimum resistance to flow when open. These valves shall be so constructed that the packing glands and control handles are separated from the valve bodies by a sufficient length of low conductivity material to reduce to minimum the collection of frost on the control handles when low temperature gas or liquid is passing through or in contact with the valve parts.

(3) Control valves and shutoff valves shall be of approved design and fabricated from materials not adversely affected by extended periods of contact with the lading in the liquid or vapor phase, or moist air and water.

(4) Packing, if used in these valves, shall be satisfactory for use in contact with the lading in the liquid or vapor phase and shall be of approved materials which will effectively seal the valve stem without causing difficulty of operation.

(5) Control valves and shutoff valves shall be so installed that they can be readily operated and their control handles will be readily accessible to the operator. These valves shall be so mounted that operation of the valves will not transmit excessive forces to the piping system.

(b) *Gauges.* Instruments necessary to the effective and safe operation of the tank when transporting, transferring or storing the liquid commodities for which the car is designed shall be provided. Instruments, except portable instruments, shall be securely mounted on panels within suitable protective housing and shall include the following:

(1) *Liquid level gauge.* Connections shall be provided for a liquid level gauge

approved design to indicate the quantity of the lading. The gauge, if not portable shall be mounted in a position where it will be readily visible to an operator during transfer operations or storage. The connection for a portable gauge must be readily accessible.

(2) *Fixed dip tube.* A fixed length dip tube shall be provided with a manually operated shutoff valve located as close as possible to the outer shell and within a suitable housing. It shall be so installed as to indicate the maximum liquid level for the allowable filling density at 1 p.s.i. for hydrogen and at the respective filling pressure, not to exceed 20 p.s.i. for ethylene.

(3) *Vapor phase pressure gauge.* A vapor phase pressure gauge of approved design shall be provided to indicate the vapor pressure within the inner container. The gauges shall be mounted so as to be readily visible to an operator.

(4) *Vacuum gauge.* Connections shall be provided for a vacuum gauge of approved design to indicate the absolute pressure in the annular space between the outer shell and the inner container. The gauge, if not portable, shall be mounted in a position where it will be readily visible to an operator. The connection for a portable gauge shall be readily accessible.

§ 179.400-22 Protective housings.

(a) The protective housings specified for all valves, gauges, and closures shall be designed to protect the enclosed components from direct solar radiation, mud, and, adverse environmental exposure, and mechanical damage. The housings shall be so designed as to provide reasonable access to the enclosed components for operation, inspection, and maintenance, and so that vapor concentration cannot build up to a dangerous level inside the housings in the event of valve leakage or safety relief valve operation. The closure shall be operable by personnel wearing heavy gloves and shall incorporate provisions for locks or seals.

§ 179.400-23 Operating instructions.

(a) *Identification.* All valves and gauges shall be clearly identified with corrosion-resistant name plates. A plate of corrosion-resistant material bearing directions and precautionary instructions for the safe operation of this equipment during storage and transfer operations shall be securely mounted so as to be readily visible to an operator. This instruction plate shall be mounted in each housing containing operating equipment and controls for product handling. The instructions shall be clear, concise and adequate in the description of the operations to be performed by the operator during storage or transfer operations. These instructions shall include a diagram of the tank and its piping system, with the various gauges, control valves, and safety relief devices clearly identified and located. The operating instructions for the vacuum system may be on a separate plate which is installed only in the housing containing vacuum controls and gauges.

§ 179.400-24 Stamping.

(a) Each tank shall be marked certifying that the tank complies with all requirements of this specification. These marks shall be as follows:

(1) DOT ----- (insert applicable number per § 179.401) in letters and figures at least three-eighths inch high stamped plainly and permanently into the metal near the center of the main head of the outer shell at the "B" end of the car by the tank builder or the party assembling the complete tank unit. This mark must also be stenciled on the outer shell in letters and figures at least 1½ inches high by the party assembling the complete car.

(2) Initials of the builder of the inner container, together with information as to the material used for the shell and heads of the inner container, shell thickness, head thickness and inside diameter of the inner container, shall be stamped in letters and figures at least three-eighths inch high into the metal immediately below the marks specified in § 179.400-24(a) (1).

(3) Initials of builder of the outer shell in letters and figures at least three-eighths inch high stamped plainly and permanently into the metal immediately below the marks specified in § 179.400-24(a) (2).

(4) Date of original test of inner container and initials of party conducting the test in letters and figures at least three-eighths inch high plainly and permanently stamped immediately below the marks specified in § 179.400-24(a) (3). Any marking, stenciling or stamping on the shell or heads of the inner container is prohibited. These markings shall also be stenciled on the outer shell in letters and figures at least 1½ inches high.

(5) Initials of company assembling the complete car in letters and figures at least three-eighths inch high plainly and permanently stamped immediately below the marks specified in § 179.400-24(a)

(4). These marks shall also be stenciled on the outer shell in letters and figures at least 1½ inches high.

(6) In lieu of stamping required in § 179.400-24(a) (1), (2), (3), (4), and (5), the markings specified by these paragraphs may be incorporated on a data plate of corrosion-resistant metal fillet welded in place on the main head of the outer shell of the "B" end of the car.

§ 179.400-25 Stenciling.

(a) The outer shell of the tank shall be stenciled in compliance with the requirements of AAR Specifications for Tank Cars, Appendix C.

(1) Date on which the principal safety relief valves were tested, pressure at which tested, place where tested and initials of party making test shall be stenciled on the outer shell in letters and figures at least 1 inch high.

(2) The date on which the frangible disc was replaced and the initials of the party making the replacement shall be stenciled on the outer shell in letters and figures 1 inch high.

(3) Tank cars of approved design built to this specification are authorized for the transportation of liquefied ethylene only for liquefied hydrogen only. The name of the commodity for which the tank was designed shall be indicated by stenciling the name of the commodity followed by the word "Only" in letters at least 1½ inches high on the outer shell immediately above the marks specified in § 179.400-24(a) (1).

§ 179.400-26 Certificate of construction.

(a) See § 179.5.

(Z) By amending the heading and paragraph (a) table in § 179.401 as follows:

§ 179.401 Individual specification requirements for liquefied hydrogen only or liquefied ethylene only tank car tanks.

(a) * * *

| DOT specification | 113A60W | 113A120W | 113A175W |
|------------------------------------------------------------|----------------------|-------------------------|------------------|
| Material (see § 179.400-6)..... | Stainless steel..... | 9 percent nickel steel. | Stainless steel. |
| Bursting pressure, p.s.i. (see § 179.400-4)..... | 240..... | 300..... | 440. |
| Minimum thickness, inches, shell and head..... | 3/16..... | 3/16..... | 5/16. |
| Test pressure, p.s.i. (see § 179.400-11)..... | 60..... | 120..... | 175. |
| Safety-relief devices: | | | |
| Safety vent, maximum bursting pressure, p.s.i..... | 60..... | 120..... | 175. |
| Tolerance, p.s.i..... | +0, -10..... | +0, -17..... | +0, -22. |
| Safety-relief valve: | | | |
| start-to-discharge..... | 30..... | 75..... | 115. |
| start-to-discharge tolerance..... | +2.0..... | +3.0..... | +4.0. |
| vapor-tight, minimum..... | 24..... | 60..... | 95. |
| Pressure control device start-to-vent, p.s.i. maximum..... | 17..... | | 17. |
| Outer shell safety vent, p.s.i. maximum..... | 16..... | 16..... | 16. |
| Liquid temperature, F. minimum..... | -423..... | -153..... | -423. |

(AA) By amending Subpart G heading to read as follows:

Subpart G—Specifications for High Pressure Tank Car Tanks (Class 107A)

(BB) By amending paragraph (b) in § 179.500-3; amend paragraph (a), and (c) formula in § 179.500-4; amend paragraph (a) in § 179.500-5; amend paragraph (c) in § 179.500-6; amend heading, paragraphs (a), (b) in § 179.500-7; amend paragraph (b) in § 179.500-8;

amend paragraph (a) in § 179.500-10; amend paragraph (c) in § 179.500-12; amend the heading and paragraph (a) (7) in § 179.500-17 to read as follows:

§ 179.500-3 Type and general requirements.

* * * * *

(b) For tanks made in foreign countries, chemical analysis of material and all tests as specified shall be carried out within the limits of the United States under supervision of a competent and disinterested inspector; in addition to

which provisions in § 179.500-18(b) and (c) of this section shall be carried out at the point of manufacture by a recognized inspection bureau with principal office in the United States.

§ 179.500-4 Thickness of wall.

(a) Minimum thickness of wall after forming of each finished tank shall be such that at a pressure equal to seven-tenths of the marked test pressure of the tank, the calculated fiber stress in pounds per square inch at inner wall of tank multiplied by 3.0 will not exceed the tensile strength of any specimen taken from the tank and tested as prescribed in § 179.500-7(b). Minimum wall thickness after forming shall be one-quarter inch.

(c) * * *

d = Maximum inside diameter (inches) for the location under consideration; to be determined by direct measurement to an accuracy of 0.05 inch;

t = Minimum thickness of wall after forming for the location under consideration; to be determined by direct measurement to an accuracy of 0.001 inch.

Take $D = d + 2t$.

Calculate the value of

$$\frac{D^2 - d^2}{D^2 + d^2}$$

§ 179.500-5 Materials.

(a) Steel used to build tank shall be as specified in AAR Specifications for Tank Cars, Appendix M, section M.10.00.

§ 179.500-6 Heat treatment.

(c) A magnetic particle inspection shall be performed after heat treatment on all tanks subjected to a quench and temper treatment to detect the presence of quenching cracks. Cracks shall be removed to sound metal by grinding and the surface exposed shall be blended smoothly into the surrounding area. A wall thickness check shall then be made of the affected area by ultrasonic equipment or other suitable means acceptable to the inspector and if the remaining

wall thickness is less than the minimum recorded thickness as determined by § 179.500-4(b) it shall be used for making the calculation prescribed in § 179.500-6(b).

§ 179.500-7 Mechanical property tests.

(a) Mechanical property tests shall be made on two tension test specimens prepared in accordance with the dimensional requirements of AAR Specifications for Tank Cars, Appendix W, Figure W3. The specimens shall be taken 180° apart, one from each ring section cut from each end of each forged or drawn tube before necking-down, or one from each prolongation at each end of each necked-down tank. These test specimen ring sections or prolongations shall be heat treated with the necked-down tank which they represent. The width of the test specimen ring section shall equal, at least, its wall thickness. Only when diameters and wall thickness will not permit removal of 0.505 inch by 2 inches gauge length specimens laid in the transverse direction, may specimens cut in the longitudinal direction be substituted. When the thickness will not permit obtaining a 0.505 specimen, then the next largest diameter specimen obtainable in the longitudinal direction shall be used.

(b) Yield strength as determined by extensometer, shall not exceed 70 percent of tensile strength for class I steel or 85 percent of tensile strength for class II and class III steel. Determination shall be made at cross head speed of not more than 0.125 inch per minute with an extensometer reading to 0.0002 inch. The extensometer shall be read at increments of stress not exceeding 5,000 pounds per square inch. The stress at which the strain first exceeds stress

(pounds per square inch)

30,000,000 (pounds per square inch) plus 0.005 (inches per inch) shall be recorded as the yield strength.

(1) Elongation shall be at least 18 percent and reduction of area at least 35 percent.

NOTE 1: Upon approval, the ratio of yield strength to ultimate strength may be raised to permit use of special alloy steels of definite composition that will give equal or better mechanical properties than steels herein specified.

§ 179.500-8 Openings in tanks.

(b) Joints between covers and ends and between cover and attachments shall be of approved design and made tight against vapor or liquid leakage by means of a confined gasket of suitable material.

§ 179.500-10 Protective housing.

(a) Safety-relief devices, and loading and unloading valves on tanks shall be protected from accidental injury by approved metal housing, arranged so it may be readily opened to permit inspection and adjustment of safety-relief devices and valves, and securely locked in closed position. Housing shall be provided with opening having an area equal to twice the net orifice area of safety-relief device enclosed.

§ 179.500-12 Safety-relief devices.

(c) Cars used for the transportation of flammable gases shall have the safety-relief devices equipped with an approved ignition device.

§ 179.500-17 Stamping.

(a) * * *

(7) Name of gas for which tank car is being used, stenciled in letters at least 1½ inches high on each side of car where they are clearly visible.

§§ 179.100-2, 179.200-8, 179.200-14, 179.200-18, 179.200-24, 179.300-9, 179.300-18, 179.500-3, 179.500-17, 179.500-18 [Amended]

(CC) By amending §§ 179.100-20(a); 179.200-8(c), 179.200-14(a), 179.200-18(a)(1), 179.200-24(a); 179.300-9(a), 179.300-18(a)(1); 179.500-3(c)(2), 179.500-17(a)(1), 179.500-18-(c) by substituting "DOT" for "ICC."

§ 179.500-18 [Amended]

(DD) By amending § 179.500-18(c) by substituting "Department of Transportation" for "Interstate Commerce Commission."

[F.R. Doc. 68-13919; Filed, Nov. 20, 1968; 8:45 a.m.]